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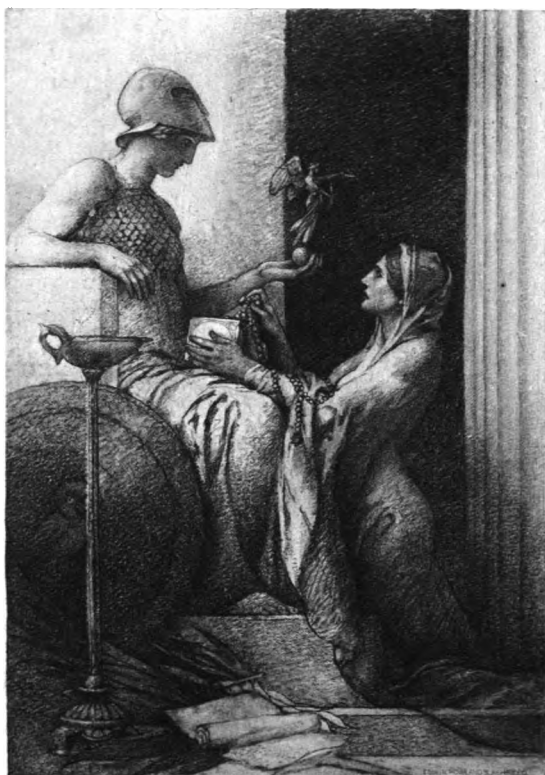
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Chronicle

Central Railway Club of Buffalo



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65-633

THIS SPACE FOR SALE

Vol. 22

OFFICIAL PROCEEDINGS

No. 1

Central Railway Club

JANUARY MEETING, 1914

PUBLISHED BY THE CLUB

Entered as second-class matter at the New York, N. Y., Post Office, February 21, 1909

HARRY D. VOUGHT, Secretary, 95 Liberty Street, New York

Subject: "Air Brakes: Why Their Possible Utility and Performance is not Obtained in a Higher Degree in Actual Service."

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Vol. XXII } New York, Jan. 9, 1914 { \$1.00 per year
No. 1 } 25c a copy

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MAY, SEPTEMBER AND NOVEMBER, AND SECOND THURSDAY
IN MARCH, AT 8 P. M.

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NEXT MEETING, THURSDAY, MARCH 12, 1914

The January Meeting

The regular meeting of the Central Railway Club was held at the Hotel Statler, Buffalo, N. Y., Friday, January 9, 1914, at 8:30 P.M., with Mr. W. F. Jones, President, in the chair.

Those who registered as in attendance were:

Arter, W. D.	Case, I. H.	Davison, Frank
Ackley, A. D.	Condit, John A.	Devans, E. J.
Ackley, William J.	Costelle, T. J.	Dambrow, W. T.
Addaman, Wm. H.	Currie, J. C.	Dorman, P. H.
Becherer, F. H.	Cunningham, J. J.	Edson, H. C.
Barnaby, Robt.	Cleary, Frank	Elmes, R. W.
Bassett, G. L.	Charlton, Geo. J.	Edwards, F. B.
Brann, Joseph	Chidley, Jos.	Elmer, William
Bailey, H. A.	Conroy, Joseph M.	Fleming, D. B.
Biehl, John	Calkins, A. E.	Ford, F. L.
Burton, Ed.	Carliss, Thomas E.	Friederick, George
Bahn, A. W.	Carey, J. A.	Fritts, J. C.
Breene, Thos. H.	Crossman, W. L.	Fryer, H. H.
Boa, Ed. R.	Crone, A. E.	Foster, F. J.
Burgess, Geo. E.	Cressler, L. Richard	Fosnight, P. F.
Brigham, H. R.	Deibert, J. H.	Greenleaf, William
Barie, Jacob H.	Darson, J. G.	Graham, J. A.
Berg, A.	Dodd, L. G.	Greenenough, E. H.
Bieber, Howard H.	Detrick, H.	Glass, R. M.
Barr, J. J.	Dayton, F. L.	Gould, J. O.
Butts, H. M.	Dow, T. W.	Goodwin, J. T.
Barton, J. Leon	De Witt, Wm. E.	Gardner, G. C., Jr.
Bodhorn, J. A.	Dehnert, Paul	Graff, J. J.
Ball, George H.	Douglas, H. J.	Green, F. V.
Butler, Jas. J.	Daly, Thomas	Ganson, Fred C.
Biber, A. C.	Deiter, P. W.	Gibney, James W.
Cooper, W.	Donlin, Thos.	Gibbons, P.
Collins, Walter F.	Davies, W. F.	Gorman, P. F.
Corey, Bloss P.	Donahue, C. M.	Gipp, Chas. H.
Callan, F. A.	Dittman, J.	Garvin, H. L.

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 Harris, Elmer E.
 Hurley, W. J.
 Jackson, Wm. M.
 Johnson, J. B.
 Jennings, Geo. W.
 Jaeger, H. H.
 Jones, H. W.
 Johnson, L. T.
 Jones, W. F.
 Kane, Joseph
 Kane, J. H.
 Lowman, N. B.
 Leid, William
 Lynch, Chas.
 Lyons, T. F.
 Lawson, A.
 Leary, John J.
 Lasker, W. K.
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 Passmore, H. E.
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 Sleeter, W. W.
 Stroke, C. J.
 Schlien, William F.
 Sanford, W. H.
 Simmons, L. G.
 Schulte, Henry
 Singer, Jos.
 Skelton, J. A.
 Sneck, Harry

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 Varley, H. H.
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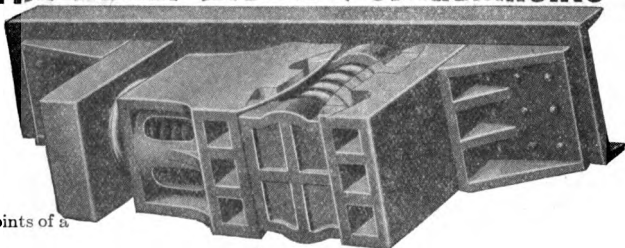
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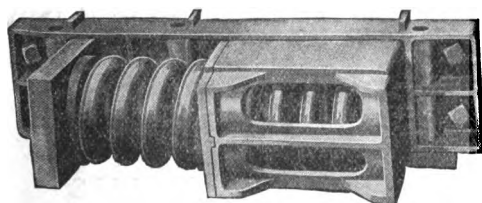
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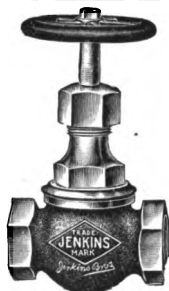
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The PRESIDENT—Gentlemen, you will please come to order. We will not have the roll call as that has been provided for by the attendance cards, and we will omit the reading of the minutes of the previous meeting as they have been published and each member no doubt has received his copy. As we have been somewhat delayed in getting started tonight, owing to the fact that this is the annual meeting and additional time given for the payment of dues, the president will say very little except to thank you for this remarkably satisfactory attendance. It is gratifying to the officers that the membership has responded so nobly to the call for this meeting to listen to a paper that will be presented by one of the leading experts in the country on air brakes and I know it will be a pleasure to meet such a representative body of railroad men and those associated with them.

Before we have the paper we have a little business that we must transact and I will call upon the Secretary-Treasurer for a report of the work of the different committees. The first report will be from the executive committee, to be presented by Mr. Harry D. Vought, the Secretary-Treasurer of the Club.

The SECRETARY—Mr. PRESIDENT and gentlemen, while the executive committee did a great deal of business this afternoon, it was in some respects largely routine. The committee is more than pleased to state that according to the annual report of the Secretary-Treasurer the Club finds itself in the possession of the largest bank balance on Jan. 1 that has been reported for a long time. The annual report of the Secretary-Treasurer is as follows:

ANNUAL REPORT OF THE SECRETARY-TREASURER

To the Officers and Members of the Central Railway Club:

Gentlemen: The undersigned begs leave to report for the year ended December 31, 1913:

RECEIPTS

Balance on hand Jan. 1, 1913.....		\$337.07
From Dues.....	\$1,314.00	
" Advertising.....	1,843.00	
" Sales of Proceedings.....	140.00	
" Bank Interest.....	21.33	
" Miscellaneous Sources.....	424.00	
		<u>3,742.43</u>
		\$4,079.50

DISBURSEMENTS

For Printing.....	\$1,017.08	
" Entertainment.....	1,016.80	
" Salaries.....	850.00	
" Miscellaneous Expenses.....	170.48	
		<u>3,054.36</u>
Balance on Hand Jan. 1, 1914.....		\$1,025.14

PRATT & LETCHWORTH CO., Malleable & Steel Castings

MEMBERSHIP ACCOUNT

Number of members Jan. 1, 1913.....	726	
" " new members elected.....	103	
" " members reinstated.....	50	879
" " members resigned.....	23	
" " members died (not including an honorary member).....	9	
Number of members dropped for unpaid dues of 1912 and want of correct address.....	213	245
Total number of members Jan. 1, 1914.....		634

BALANCE SHEET

Balance on hand Jan. 1, 1914.....	\$1,025.14
Due from 46 members for 1912 dues.....	92.00
Due from 70 members for 1913 dues.....	140.00
Uncollected advertising 1913-14.....	418.00
	\$1,675.14

Respectfully submitted,

HARRY D. VOUGHT, Sec.-Treas.

Members who have not paid their dues for 1912 were today suspended from membership by the committee and they stand suspended and deprived of all privileges and the literature of the Club until they reinstate themselves by paying the amount they owe; but it is very gratifying to say that since this report was prepared as covering 1913 some of them have paid their indebtedness.

The committee is more than gratified to announce that its members find themselves in better shape with respect to keeping their promise to you that the annual dinner to be held on the night of March 12th will be graced by the presence of speakers who will maintain the very high standard which has been established for several years by this organization. The toastmaster will be Mr. B. D. Caldwell, president of the Wells-Fargo Express Company, and Mr. George A. Post, president of the Railway Business Association and of the Standard Coupler Company, will be one of your speakers. Invitations have been extended to two or three other men of equal prominence and there is a fair prospect of their acceptance. Until that has been received we dare not say positively that they will be with you.

We have a number of new members, Mr. President. So many have come in tonight that until the list can be completed no report can be made as to the total number but it will be ready before the meeting adjourns.

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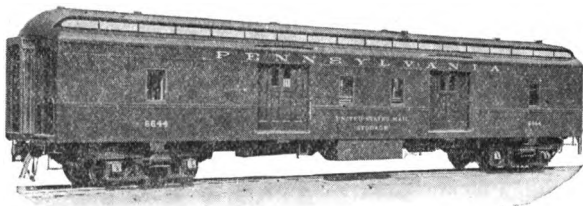
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BUFFALO, N. Y.

The PRESIDENT—Are there any other reports from any other committee, Mr. Secretary?

The SECRETARY—Committee named to award premiums in new membership contract has filed a report.

The PRESIDENT—We will listen to that later. Gentlemen, you have heard the report of the executive committee as given to you by the secretary. The committee during the past year has worked very hard for the success of the Club. It is very gratifying to know that the finances are in very good condition and the prospects for the coming year of 1914 very good.

We will now have presented a paper by Mr. Walter V. Turner, Chief Engineer of the Westinghouse Air Brake Company, on the subject of "Air Brakes: Why Their Possible Utility and Performance is not Obtained in a Higher Degree in Actual Service." It gives me much pleasure, gentlemen, to introduce Mr. Turner.

"AIR BRAKES: WHY THEIR POSSIBLE UTILITY AND PERFORMANCE IS NOT OBTAINED IN A HIGHER DEGREE IN ACTUAL SERVICE."

BY WALTER V. TURNER
CHIEF ENGINEER, WESTINGHOUSE AIR BRAKE CO.

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It is with pleasure and yet with some reluctance that I come here to-night to address you on the subject of Air Brakes; pleasure, because of meeting with you and because called to speak upon a subject which is of such importance and value to the railroads and consequently to the country at large; reluctance, because I know that I will not be able this evening to do justice to the subject and because I feel at the outset that the discussion will not be attempted along lines some of you had hoped would be the case. That is to say, the discussion will be more along the lines of what is involved in an electro-pneumatic brake than of the recitation of results obtained in a specific case, for as some of you are no doubt aware, those concerned in recent tests are compiling a record, which, naturally, is beyond my province to make public. However, this is in reality very unimportant as the results of such designs as I shall bring to your attention to-night can be just as positively and completely stated by a consideration of the factors involved as though they had been deduced after the event instead of before. In fact, the results of the recent tests were practically mapped out before the tests were made. In other words, it is now a practicable possibility to prognosticate the result that will be attained by any brake of which the physical characteristics can be ascertained, without so much as a single

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run being made. This being the case, it is of far more importance to be informed of and to understand the fundamental considerations involved in the design of a brake and its installation, as well as what is required to realize and maintain its efficiency, than it is to know the result obtained in any specific case. In other words, if these are known, the same result can be produced in all cases, whereas knowing the result itself will enable no one to produce a repetition.

Now, I want to be very emphatic in making these statements and it may help to emphasize them if I say that the viewing of a bridge or locomotive merely as a result will not enable one either to reproduce the bridge or construct a locomotive, but if one is versed in the principles and factors underlying the design and construction of either one or both, they can be reproduced *ad infinitum*. Do not think because I make these statements that I imagine there are not many who know all the factors involved, etc., for there are. Nor am I much concerned as to whether many do or not; what I am concerned about is that, after the design is completed and installed, the consideration continue to the extent that proper conditions are assured to permit of the proper operation of the brake.

The human equation is such an important element in the proper performance of a brake, that unless it can be induced to exert itself in the proper direction and to co-operate with the brake to attain the end sought, there will be a vast difference between the result contemplated and embodied in the design and that which is realized in practice. The human factors enter into the performance at the beginning and end only at the end, and I refer not so much here to the actual manipulation which produces brake action as I do to conditions permitted to exist in the way of train make up and brake maintenance. In other words, those concerned on a railroad with the installation and performance of a brake should know what absolutely must result from the design and how this will be modified by the conditions with which the brake has to contend. If one knows that consequent must follow antecedent in a brake, as well as in other mechanical contrivances and, in addition, knows its limitations, which unfortunately a brake has, a performance will not be expected where proper conditions for it do not exist. Moreover, those grounded in the principles and functions will not hope to remedy failures, or even shortcomings, by attributing them to the design, or by mistake in the source of the trouble, or by juggling with the effect when one's energy should be devoted to the cause.

I have had some astonishing experiences in connection with complaints of air brake troubles and failures, which almost invariably, upon investigation, have turned out to be due, not to what is commonly supposed to be the air brake, that is, the air actuated devices whose failures are generally limited to a failure to release after such a "light" application that it can hardly be expected to, but to installation, lack of maintenance, improper manipulation, failure to maintain proper proportions; in fact, to a general tendency to treat the problem of controlling trains as an art instead of a science. As an art, one can use his imagination and individuality on it to the satisfaction of his own sweet will, but it so happens that instead of an art, it is a science with laws rigid and fixed, and principles underlying it also as fixed in all their factors as are those of other sciences, and, consequently, must be so treated if results approaching the possibilities are to be realized.

Sometimes I think this air-brake problem is more psychological than mechanical, and have often said that the mechanical side of it is

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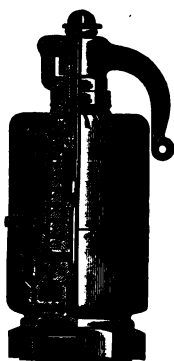
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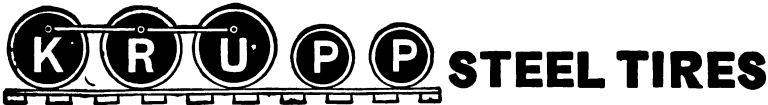
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comparatively easy, for that one can fix and it will stay fixed, but the human side of the problem is so changeable and elastic that the reducing of this to a science is certainly *some* problem.

Failures and troubles arising from imperfect or improper operations of the air brake mechanism, per se, are relatively very few, and a complete investigation whenever made demonstrates this affirmatively, but the more frequent proof of what I have said comes from the negative evidence, namely, that an investigation, which is generally made on the air actuated apparatus itself, seldom develops any proof, but, strange to say, the presumption of guilt still remains, and always will until those concerned look farther afield for the real cause or trouble; after this, they will find that they are asking of the air valves something not possible in their design, that is, functions compensatory for shortcomings outside of itself, both mechanical and psychological.

Perhaps the reasoning I have mentioned is quite natural, since on the one hand it is difficult to find out what the human end of the thing really did, and on the other, that all the parts except the air valves were dormant until the air actuated parts caused them to act. To be dormant is to be harmless, and, therefore, easy to prove that they did no wrong until forced to do so by the air mechanism. But what a weak reasoning process is this, to conclude that the actuating means must assume the responsibility of what are in fact defects of complementary mechanism. One might as well blame a train for being wrecked by a broken rail, for, obviously, the broken rail would not have mattered if the train had not come along.

Please do not conclude that I am setting up an alibi for the air mechanism or intend any special pleading, for this is not so. I am simply asking that failures or troubles be traced to their true cause, for by knowing this, only can a remedy be provided.

Some may think this paper deals with parts of the subject that are beyond the province of many here, and it does, but if those whose province it is, are influenced by it, it will help all of us, so it is of interest to all of us. Moreover, I owe all of you an apology for not preparing advance copies, since without them, some of the paper can hardly be discussed; still I feel I must make the paper complete enough to be, I hope, of service for many years to come.

The brake is not a "one man proposition," for, in my judgment, it requires the same amount of knowledge and capacity to insure its performance as it does to incorporate the requirements of a brake into a design. This is particularly true where new functions are employed, since it is quite evident that some adjustment of existing conditions may be required before the full benefit of these functions can be realized. In fact, conditions may be so bad as to make their employment seriously objectionable; whereas, if conditions that are easily adjustable were modified, vast returns in revenue would result from such improvement. This is not theory, neither is it visionary, for not only I, but perhaps many of you, know of cases where the results I speak of have been obtained by the use of such improvements, where, in others, such returns are not realized because the requisite assistance is not forthcoming.

Manifestly, then, in order that any of you may be able to deduce for yourself the correctness of the position stated, it is desirable that I enumerate the basic principles and requirements underlying the design and installation of an automatic brake, with a statement of some of the factors and conditions which will adversely influence the performance

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of the brake, some of them going so far as to make some of the operations of the brake seriously damaging, and, unfortunately, the more efficient the brake is designed to be, the worse will be the results where such conditions are permitted to exist. Under circumstances where such conditions cannot be modified, it is certainly advisable that a brake of a relatively low order of efficiency be employed, as it is quite within the bounds of probability to suppose that all the gains resulting from the employment of an efficient brake will be more than offset by troubles and damages arising from the endeavor to use it under conditions which are practically prohibitive. That is to say, it may be better to run shorter and fewer trains and these at lower speeds and thus limit a road's capacity than to try by the use of an efficient brake to neutralize the risks accompanying the operation of long, heavy, frequent, and high speed trains where prevailing conditions interfere with the performance of the brake.

BASIC REQUIREMENTS OF AN AUTOMATIC BRAKE.

Definition.—The automatic air brake is a device for controlling railroad trains, dissipating in the form of heat produced by frictional work the kinetic energy which they possess by virtue of their weight and motion.

A satisfactory brake must possess

1. Reliability,
2. Flexibility,
3. Effectiveness.

1. *Reliability* or certainty of operation is a fundamental requisite, depending upon correct design and reasonably good maintenance, the essential principle being that any variation from normal condition must tend toward an automatic application of the brake, and not tend to render the obtaining of a brake application when desired less certain.

2. *Flexibility* involves an extension of time in which to obtain predetermined braking forces and the ability to vary these braking forces up or down, the extension of time being a function of

- (a) Range between zero braking force and maximum braking force.
- (b) Proportion of reservoir and brake cylinder volumes.
- (c) Low degree of braking force per unit of brake cylinder pressure.

3. *Effectiveness* involves

(A) *Service.*

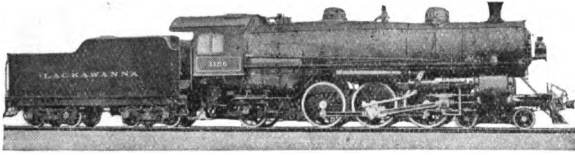
- (a) Maximum degree of braking force with flexibility requirements mentioned above.

(B) *Emergency.*

- (a) Elimination to the last degree of the time required to transmit the application from one end of the train to the other and of the time required to obtain maximum brake forces on individual cars.

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(b) Degree of braking force obtained and maintained.
Flexibility is obtained in present brake installations by

- (1) Extending the time required to make a service brake application over a period of $5\frac{1}{4}$ seconds (minimum) to $6\frac{1}{4}$ seconds (maximum).
- (2) Fixing a range of 24 lbs. between the initial and final brake pipe pressure required to obtain this full service braking force.
- (3) Proportioning the auxiliary reservoir volume to the brake cylinder and clearance volumes, with a pre-determined piston travel, so that the theoretical equalization pressure of the auxiliary reservoir and brake cylinder, from 84 lbs. initial brake pipe pressure, will be 60 lbs.

NOTES:

(A) Any desired increase of braking force for

- (1) Service brake applications must be obtained by an increase in the brake pipe pressure on account of the requirements of flexibility (service brake).
- (2) Emergency applications by additional brake cylinders or increase in the reservoir volume for emergency applications only, or an increase in the initial pressure carried, also for emergency only.

(B) The ratio of auxiliary reservoir volume to brake cylinder volume being fixed by

- (1) The diameter of the brake cylinder.
- (2) By the predetermined and (assumed) fixed piston travel.
- (3) By the fall of pressure permitted in the auxiliary reservoir.

Such a fixed leverage ratio (multiplication of total brake cylinder force, effective at the brake shoes) should be established, as will properly provide for lost motion, defects, etc., in all parts involved. That is, so that sufficient clearance between brake shoes and wheels will be insured. (Compensation for brake shoe wear is a matter of maintenance, either manual or automatic.)

(C) From the preceding it follows:

- (1) The apparatus employed in connection with the automatic air brake should satisfy the above requirements.
- (2) Any additions to or modifications of this apparatus should conform to and maintain unimpaired the basic requirements above outlined.

(D) The relations stated will hold strictly true (within the narrow range of variations permissible in any mechanical contrivance of this character), for full equalization provided the apparatus is *in proper* working order.

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For graduated brake applications short of equalization a greater variation in the results will be obtained on account of circumstances entirely beyond mechanical control.

Variation in resultant operations may be caused by the apparatus *not being in proper working order* caused by

- (1) Lack of maintenance.
- (2) Defective equipment.
- (3) Additional equipment inconsistent with the existing apparatus conforming to basic requirements outlined above.
- (4) Trains too long for the type of apparatus used.
- (5) Make up of train (loads and empties).
- (6) Slack between cars.

The preceding can be formulated into the following concrete statements:

That to handle trains without great risk of shocks, and with sufficient degree of latitude for the engineer's judgment; to minimize the bad effect of the time lapse between brake applications on different vehicles; and for other adverse conditions, it is necessary that the retarding forces be obtained gradually, and that the maximum be comparatively low. This latter, not only for the reasons given above, but also to keep the risk of wheel sliding at a minimum for service applications, and to insure a reserve of sufficient additional force for emergency stops.

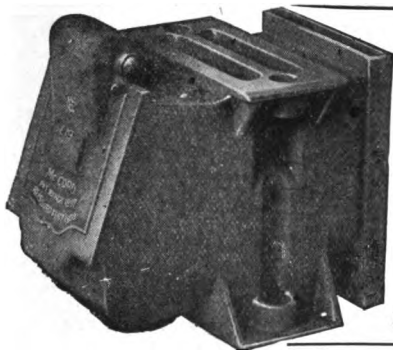
That 90% braking power for service application (that is, ordinary stops) has been the generally accepted limit (and is the standard to-day for practically all the roads in this country), and the range of reduction over which this is spread for a proper degree of flexibility is 24 pounds, and the time in which this is done is 6 seconds.

With the above accepted, any increase for the emergency brake must come, first, from an increase of the initial pressure carried; second, by brake piston area added; third, by additional reservoir volume added—all for the emergency brakes only. (Of course, a combination for any two or all three of these methods may be used).

These have been the underlying principles of air brake design and installation for the past 40 years, and practically all its philosophy emanates from, and is contained therein.

To answer the question, which naturally occurs to one—why not change this standard since it has been in existence for 40 years, it is asserted that this standard is as necessary for present conditions as it was for those for which it was designed, since brake applications are more frequently required, trains longer and the vehicles much heavier. Therefore, it is a self-evident proposition that extreme flexibility is imperative, if rough handling is to be avoided. If any change whatever is made, it should be made in the direction of obtaining the braking force even more gradually than at present, unless simultaneous action of the brakes is assured by electric transmission.

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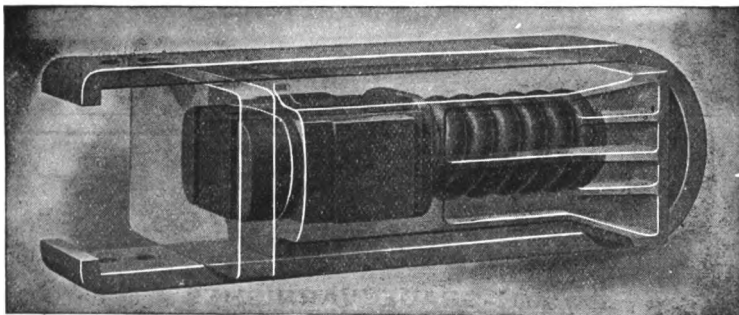
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FACTORS AFFECTING BRAKE PERFORMANCE.

Another thought with which I desire to impress you is that the brake may in a certain sense be very properly divided into two parts, namely, the air operated devices and the foundation brake gear, and by foundation brake gear is meant all of the parts affected by the operation of the brake piston, that is, rods, levers, shoes and truck. These, and not the air operated mechanism itself, are the variables, for it is upon these generally that come the forces with consequent wear and tear. Hence, the very great importance that the foundation brake gear be of the very best design and maintenance of a high order. The foundation brake gear should be strong and not subject to distortion, and for modern heavy cars should be of what is known as the clasp type, otherwise the shoe pressure may so force the journal box over against the pedestal as to interfere materially with the wheel following the vertical inequalities of the track; while the truck should be of such a design as to permit of the proper installation of the foundation brake gear and should be strong enough not to be distorted.

In designing cars, it has been the custom to pay little or no attention to the brake installation until the car and truck have been designed, then the brake installation has to be made the best and sometimes the worst way it could. It may be asking too much to expect that the car be built around the brake installation, but, as a matter of fact, if proper economy, efficiency and safety are to be assured, this is as it should be; that is to say, a proper brake design and installation must include certain well-defined provisions, and if these are not possible of incorporation after the trucks and cars have been designed, the brake efficiency will suffer accordingly and a prolific source of trouble may have been embodied in the design as a whole. I am glad to say that in the last two or three years, there has been a marked change in this respect, and in some few cases, the brake is being considered as a part of the car, that is, a part of the whole design, with consequent limitations in parts of the design that would interfere with the incorporation of an efficient brake design and provision made for it in others. Beyond doubt, it will be a profitable course for all concerned when this becomes general.

In the brake shoe, we are confronted with the extreme problem as regards securing uniformity of retarding force, for the performance of this element of the brake apparatus is an extremely variable quantity, having a range of over 300% according to conditions and circumstances. This performance of the shoe depends essentially upon its temperature, increasing with the temperature up to the critical point and then decreasing until the molten point is reached (which is as far as we need to consider here), or until such rapid abrasion takes place as to virtually present a fresh contact surface which prevents the temperature rising as rapidly as would otherwise be the case. This temperature in turn depends upon three factors—(1) Upon the pressure per square inch of the shoe area in actual contact—(2) the speed at which this area is being traversed by the other contacting factor (that is, the wheel), and (3) the time the rubbing surfaces (that is, the shoe and the wheel) are in contact. If this be true, then the performance of the brake shoe is likewise affected not directly by the three factors mentioned, but indirectly, that is, by the heat generated.

The operation of the air valves themselves will vary but little, but the result of train operation will vary immensely if the condition of what may be classed as the most important part, namely, the foundation brake gear of the air brake, is not maintained reasonably constant. Little or no provision is made in the air brake apparatus proper to compensate for shortcomings elsewhere, nor can it be, but these shortcomings are

easily prevented by proper designs and maintenance, and, therefore, uniformity of result is not impossible, but is dependent upon each part of the whole brake contributing its proper share to this end.

The question is often asked, and from the standpoint of the questioner with good reason, for I know of nothing upon which more illusions or delusions exist than this, what "braking power," that is, what braking ratio between the shoe pressure and car weight is required to stop a train in a given distance? This question has all the force and meaning of the question, How old is Ann? For before this can be answered, it is necessary to know, first of all, whether the stop is physically possible, that is, whether the rail adhesion and other conditions will permit of the stop being made at all; second, what coefficient of friction will be realized under this particular condition during the stop; third, what is the efficiency of the brake rigging, and fourth, the time required to apply the brakes fully reduced to a mean time. When these are all known, or arbitrarily specified, then the "braking power," that is, braking ratio, can be stated. For example, at Toledo in 1909, it was found that 180% braking ratio was required to make a stop in 1,200 feet, while at Absecon in 1913, 150% braking ratio made the stop in 1,049 feet—the chief reason for the difference being that at Absecon the foundation brake gear was much more efficient and the time of transmission was eliminated by means for actuating the valve mechanism electrically.

In order that any one interested may assure himself that the fourth factor, namely, per cent. of braking ratio, involved in determining a given stop can only be stated after the other three are known, or fixed upon after actual train experiments are made to determine what the collective effect of the other three is, the following diagram and tables are given. Obviously, no other recourse is left but to fix the braking ratio at a point high enough to produce the given stop, unless changes are made in one or more of the other factors involved. It will be noted that the misconceptions mentioned come from speaking of braking power and not of retarding force, one is nominal, the other actual.

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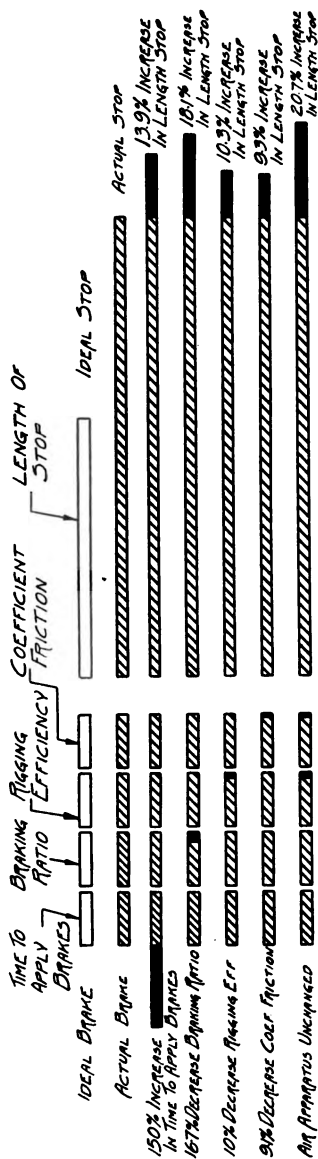
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THE SOLID AREA AT THE LEFT INDICATES A CHANGE IN ONE OF THE VARIABLES
 THE SOLID AREA AT THE RIGHT INDICATES THE CORRESPONDING CHANGE IN THE LENGTH OF STOP

Diagram 1

TABLE No. 1.
SPEED 60 M. P. H.

SINGLE CAR BREAKAWAY STOPS.					
Brake Rigging Efficiency in Per cent.	Coefficient of Friction	Time to Apply Brakes Fully	Percentage Braking Ratio	Length of Stop in Feet	Remarks
100	.25	0	100	480	Ideal brake. Distance to which stop is limited by adhesion of rail and wheel.
95	.11	2	150	851	Best stop to be expected in actual service.
85.5	.11	2	150	939	10% decrease in rigging efficiency, 10.3% increase in length of stop.
95	.10	2	150	930	9.1% decrease in coefficient of friction, 9.3% increase in length of stop.
95	.11	5	150	969	150% increase in time to apply brakes, 13.9% increase in length of stop.
95	.11	2	125	1005	16.7% decrease in braking ratio, 18.1% increase in length of stop.
85	.10	2	150	1027	10.5% decrease in rigging efficiency, 9.1% decrease in coefficient of friction, 20.7% increase in length of stop.
85	.10	5	150	1148	10.5% decrease in rigging efficiency, 9.1% decrease in coefficient of friction, 150% increase in time to apply brakes, 34.9% increase in length of stop.

TABLE No. 2.
SPEED 60 M. P. H. TRAIN STOPS.

Brake Rigging Efficiency in Per cent.	Coefficient of Friction	Secs. to Apply Brakes Fully	Length of Stop in Feet	Percentage Braking Ratio Train	Percentage Braking Ratio Cars
95	.11	2	1200	103	105
80	.11	2	1200	122	134
95	.10	2	1200	113	120
95	.11	5	1200	116	125
80	.10	5	1200	151	180

This table develops the folly of expecting a desired stop from an arbitrarily fixed per cent. of braking ratio. It quite as emphatically demonstrates why one may be justified, in fact compelled, by the force of the specification to specify in one case, 180% braking ratio and in another, 125, since either of these two will stop the train in the same distance, the reason being that the net gain in transmission in the one case is so much greater than in the other.

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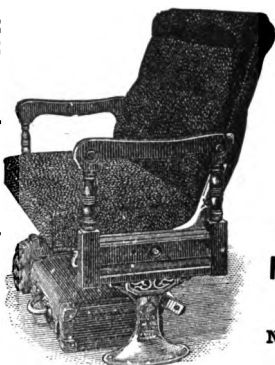
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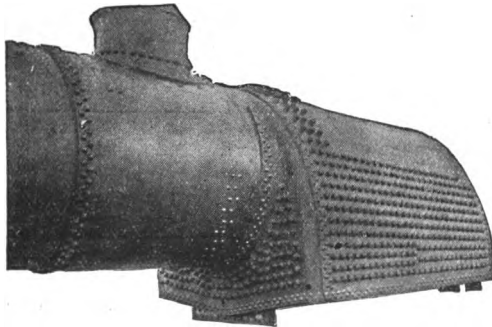
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To sum up the foregoing, there are four factors which contribute to the result of any operation of the brake, namely, the time, the braking ratio of the design, the overall efficiency of the foundation brake gear, and the speed. It will be seen that the manufacturers of air actuated devices themselves only control one of these, namely, the time over which it is intended that the device should spread its operation. Therefore, it is plain that this in itself can neither be made to compensate for shortcomings in the others, nor can it be held responsible for any troubles or inconveniences due to imperfections therein. It is not difficult to maintain a practically constant condition of the air operated devices themselves and it is seldom that it is not a reasonably constant condition, since this is insured in the manufacturer's design. In other words, constancy of condition is inherent. Quite the contrary with the other factors mentioned, for they must of necessity produce a variation due to wear and tear with every brake operation—this variation going to extremes where the design is bad and slack adjusters are not employed and is at a minimum where the foundation brake gear and maintenance are at their best.

As illustrating and emphasizing that this is the case, I submit the following curves. Fig 1 shows what must result in the way of variation

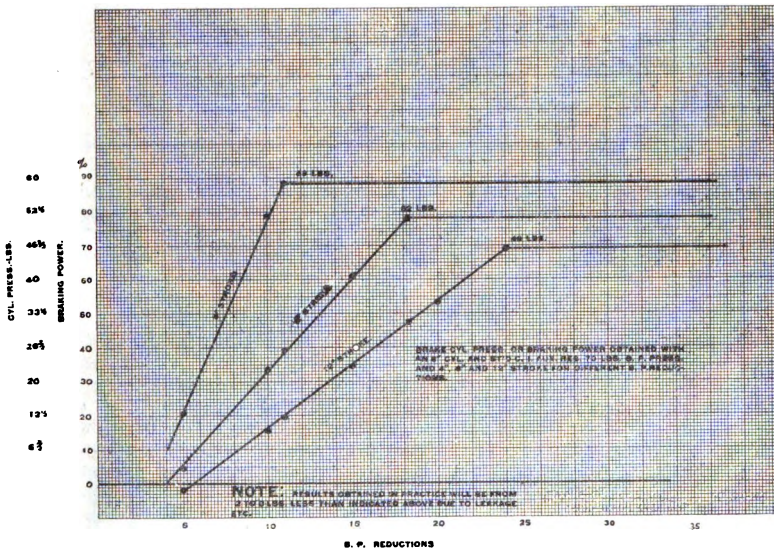


Fig. 1

of brake operation as evidenced in cylinder pressure, which, in turn, determines the retardation of the car, and, consequently, its relation in this respect to other cars in the train.

Fig. 2 illustrates the same thing in a little different way, but either is clearly sufficient to prove what must be the result if the maintenance requirements are not met, and to show that these requirements are

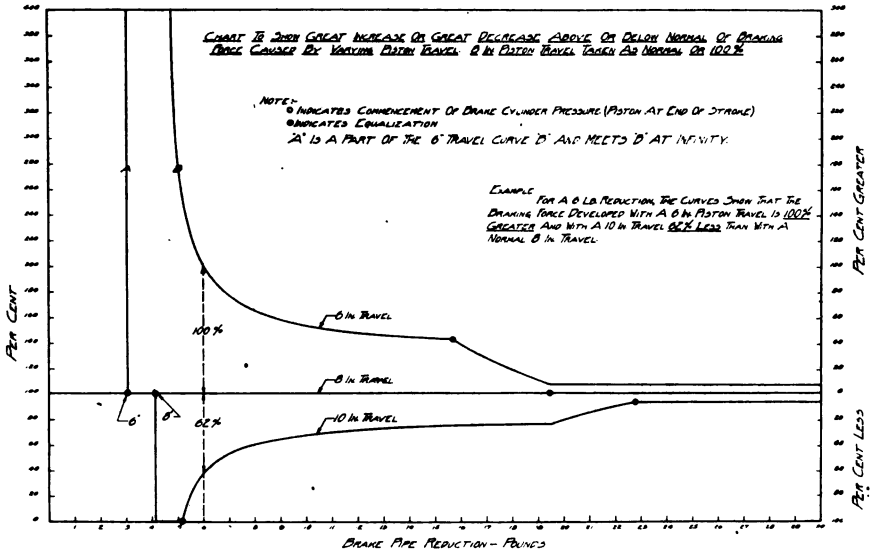


Fig. 2

not always fulfilled. I submit Fig. 3, which was based upon conditions actually existing in service. Surely, it cannot be expected that desired results can be realized under such conditions, and I beg of all interested to give their assistance and influence to the incorporation and maintenance of proper proportions in air brake operations.

Some people seem to have an idea that if they buy an improved apparatus of any class, that it is expected to be free from *all* troubles incident to the class. This is an exaggerated notion, for from the very nature of things, perfection cannot be attained, and even if it ever were, it would not so remain. Again, from the nature of things, the human partners in the operation of the apparatus and the wear and tear inherent in all terrestrial things, can always be counted upon to make trouble. Not only this, but it is quite possible that the introduction of mechanical apparatus, which is, in itself, a pronounced advancement of its class, may be productive of trouble, because a like advancement has not been made in other things that go to make up the whole, that is to say, it will show up weaknesses and shortcomings that were not apparent before, because *all* the parts that go to make up the whole were of a lower order of efficiency.

Take for instance, the introduction of the slack adjuster, so called. Here is a device of very great utility in itself, since, other things being equal, it will prevent increased piston movement, by taking up that which is incident to the wear of the brake shoe, and thus compensates, as it were, for this. This does three things. *First*, and very important, it keeps the relative proportions of the auxiliary and brake cylinder constant, and by this, insures that the brake operates properly and uniformly, as far as influenced by this, the chief influence. *Second*, it keeps the brake piston travel to such a length, as will prevent the resultant of shoe wear permitting the piston to strike the cylinder head, and cause

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A COMPLAINT OF IMPROPER OPERATION OF BRAKE EQUIPMENT AND ROUGH HANDLING

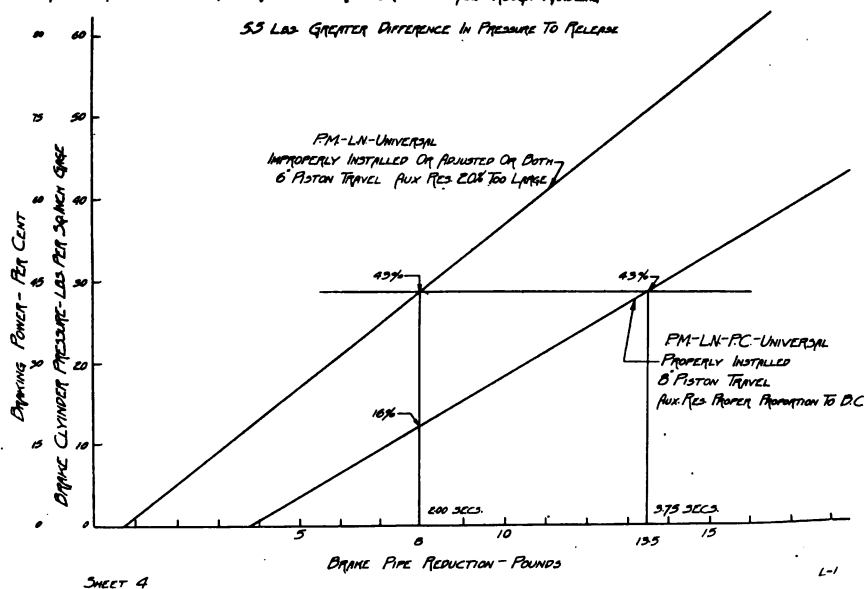


Fig. 3

the loss of the brake. *Third*, it reduces in a very large measure, maintenance necessity and expense. Surely, any one must admit that these are vital requirements in a brake mechanism. But suppose, the foundation brake rigging and truck design are such that there is considerable "lost motion" and elasticity—then the installation of the slack adjuster will result in much trouble, and other undesirable results, as it would not only compensate for shoe wear, but would also take up all the false travel, so called, that comes its way, and if the brake is any good, it will come.

As here explained, it is apparent where the shortcomings really exist, but the slack adjuster, in most cases, has been held up as the culprit.

The same thing may be said of using a single shoe brake in connection with a brake sufficiently effective and powerful to control modern vehicles. The wheel is forced over away from the brake shoe pressure, resulting in non-uniform wear of brasses, hot boxes, broken pedestal jaws, inability of wheels to follow the vertical inequalities of the track, flat wheels, because wheel weights are shifted, and so on, and I might recite many more incongruities and inconsistencies, in connection with brake equipment alone.

The remedy should be self-evident, namely, treat the matter as a whole, and insure, at least as far as each vehicle is concerned, that each part is the required complement of the other in all respects, where an advance step is to be taken. The alternative is equally as clear, namely,

leave things as they are, and put up with the losses incident to a stand-still" policy.

We have had troubles ever since we have had railroads, and we will continue to have them. Most of those we have, however, have familiar faces, because in many cases, we grew up with them and therefore, they are not denounced as new ones, but when increased efficiency is attempted, even old and familiar troubles appear to take on a new shape, and the improvement is blamed for its own and for its ancestors shortcomings.

As the context in speech is an invaluable index in its analysis or determination of meaning, so are the connecting or corresponding parts in a mechanical appliance, to an investigation and determination of the responsibilities for faults or failures.

FACTORS AFFECTING BRAKE DESIGN.

Having thus briefly outlined that brake performance is affected by two considerations—1st, design, and 2d, conditions, the next step is to state those of the brake design requirements which must be arbitrarily fixed and those which must necessarily be derived from those arbitrarily decided upon if we are to have a harmonious whole—that is to say, if we are to have a brake which will operate as it should. The factors which must necessarily be arbitrarily decided upon are—

- A. The braking ratio (total nominal shoe pressure to empty car weight) to be employed.
- B. The range of flexibility, that is, the decrease in auxiliary reservoir pressure to be permitted before the braking ratio is realized and the time in which it occurs.
- C. Shoe clearance.
- D. Brake piston travel.
- E. The unit cylinder pressure from which the braking ratio is to be obtained.
- F. The fiber stresses to be permitted, and
- G. The emergency braking ratio.

All of these factors must be decided upon before a brake installation can be made, but there are certain other values which we must know, namely,

- A. The air pressure that must be carried.
- B. The auxiliary reservoir volume required.
- C. The leverage ratio.
- D. The size of the brake cylinder.
- E. The size of the brake levers.

But these are all contingent factors, or derived values, and must be obtained from the others. In other words, they cannot be arbitrarily determined, or fixed upon as can all of the preceding fundamental requirements. To specify them without deriving them, would be an unwise risk, as the result would probably be the expression of contradictory or inconsistent values, and I submit the following (which makes evident how the derived values are secured from the fundamental values) in proof of this:

The car weight times the braking ratio specified gives the total shoe pressure.

The piston travel divided by the shoe clearance gives the leverage ratio.

U You can get good trucks, and bolsters, and brake beams, and underframes, and couplers, and build a freight car right from the wheels to the roof, but you can't go and stick in a couple of springs and have a real draft gear. And if you don't have a real draft gear you won't have a real freight car—not for any very great length of time. Its the draft gear, the right kind, that's going to keep the car in service, keep the repair charges down and the earning capacity up.

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- The total shoe pressure divided by the leverage ratio will give the total cylinder pressure required.
- The total cylinder pressure divided by the unit cylinder pressure will give the area of the piston, which fixes the size of the cylinder.
- The volume of the cylinder multiplied by the unit cylinder pressure and divided by the range of flexibility will give the volume of the auxiliary reservoir and this fixes the size of the auxiliary reservoir.
- The unit cylinder pressure plus the range of flexibility will give the necessary auxiliary reservoir pressure which fixes the brake pipe pressure to be carried.
- The total cylinder pressure with the total shoe pressure and fiber stresses to be permitted gives all the necessary information that is required to design the foundation brake gear, the particular form which this shall take depending upon car and truck design and the designer's preference.
- If the brake is a duplex brake, that is, having a service braking ratio and an emergency braking ratio, then the size or strength of the foundation brake gear must be based upon the maximum total cylinder pressure.

IT WILL BE SEEN THAT NOT ONE OF THESE EIGHT VALUES CAN BE INCLUDED AMONG WHAT WE HAVE CALLED THE FUNDAMENTAL REQUIREMENTS, AND FURTHER, AND EVEN MORE IMPORTANT, NOT ONE OF THEM CAN BE ARBITRARILY CHOSEN, but must follow in the same manner that four follows the adding of two and two if we are to have a harmonious and consistent brake, and to avoid this being dismissed with the assertion that the ideal is not attainable, I will state that by harmonious and consistent, I mean a practical brake.

All the inconsistencies that exist in brake design and installation to-day are due to the non-observance of these relationships, that is, one or more has been changed without changing the whole, and this cannot be done if the design is to contain but one set of physical dimensions.

It seems to the writer that the chief reason why the idea prevails among so many that the derived factors or values can be juggled arbitrarily, as can the fundamental or absolute values, is that, previously a distinction has not been emphatically drawn between them, showing that they will no more mix than will oil and water.

Another reason is that a number of the factors have been fixed by the manufacturers, or some other authority, and the reasons for this largely forgotten, or an analysis is not made to see why they were so fixed. In other words, it is not understood that practical considerations fix the absolute values, and therefore, the others are a mathematical result.

Still another reason is that some, not knowing that the factors involved in a brake "lay out" are composed of arbitrary and derived values, mix them indiscriminately and give an arbitrary value to one that must have a derived value. For example, they think that the auxiliary reservoir volume can be arbitrarily fixed, where, as a matter of fact, this cannot be done.

CONDITIONS AFFECTING BRAKE OPERATION.

If what is above stated is sound, it must follow that any deviation from, or change of, the fixed values, or using a derived value that is not a mathematical result from the fixed value, must result in an adverse

variation in the performance of the brake, and it makes no difference whether this departure from a harmonious whole results from improper combinations of design, or by conditions permitted to exist after the installation has been made. In other words, even though the design and installation has been all that it should be, if it is not so maintained, the resulting performance will be as bad as though either design or installation had not been what it should be in the beginning. It is plain that these undesirable results will be further aggravated by improper make up of train, resulting in great differences in braking power in different sections of the train; by the amount of slack between cars; by failure to insure proper supply of air for re-establishing the system; by improper manipulation of the manually operated parts of the brake, which is the inevitable result from the attempts made to give general instructions for the operation of these parts instead of the opposite to this, namely, that no general instructions can be given since the manipulation proper must necessarily be determined by conditions, such as, weather conditions, profile of road, make up of train, "feel" of the train, and a hundred and one other things which only the engineer at a particular time and on a particular train can gauge accurately, and it is the opinion of your orator that brake operation could be vastly improved if the old methods of instruction and examination of engineers are changed from a port and passage basis to that of instruction on the underlying principles of the brake, its functions, and how its manipulation must be modified by conditions encountered.

■. All of the foregoing applies to any brake, the worst as well as the best, and should emphasize the inconsistency of a railroad even considering the employment of the most efficient brake, even pneumatic, with the object of securing a higher efficiency in brake operation until they have secured a reasonable performance of what they already have, unless with the adoption of improvements they will at the same time take steps to insure fair conditions for its operation. If they do not, while stopping facilities and distances will, undoubtedly, be improved, it will be at the expense of many troubles and at considerable loss. This must be self-evident, since the more rapid dissipation of energy, unless done in a uniform and harmonious manner, must result in severe shocks and stresses. It is here that I may properly begin a consideration of the electro-pneumatic brake and it is very important that I make clear to you in what consists the great value of actuating a compressed air brake by electric attachments.

ELECTRICAL ACTUATION OF PNEUMATIC BRAKES.

Actuating the brakes electrically may be for one or two purposes, or both. 1st, it may be used to eliminate shocks and stresses arising from the shortcomings or inconsistencies of the pneumatic brake already in use, as well as to overcome the bad effects of numerous conditions that perhaps it is considered impossible to improve; or, 2d, it may be used to make practicable the most efficient design of pneumatic brake. That is to say, when the pneumatic brake has been brought up to its highest development with regard to the height of pressure obtained and the minimum time in which to obtain it as far as individual cylinders are concerned, the electric attachments will secure that uniformity and simultaneousness of action which is very desirable where an enormous energy is obtained rapidly.

Thus it will be seen that electric actuation of the pneumatic parts can be used for two distinct and separate purposes—one to overcome conditions not necessarily inherent in the equipment, and one where the condition, that is the development of great force, is inherent in the

equipment. Consequently, it follows that electric actuation may also be used where both sets of conditions exist in the same apparatus.

It will be seen that in none of these cases is the electric attachment advocated with the idea that it will directly materially shorten the stop, for it is evident that the utmost that can be obtained by the use of electric devices is the elimination of the time element, which, with the pneumatic brake under present operating conditions, is largely the source of its limitations, both as to the smoothness and consistency of operation in service applications, and as to the rapidity with which it is practicable to release the emergency braking force.

While the time element or lapse affecting these things is important, it is, however, but a small proportion of the time consumed in making the stop, and, therefore, its elimination cannot materially shorten the stop considered in itself. For example, when the mean time required to obtain serial action from one end of the train to the other pneumatically is one second, and the train running at a speed of 60 miles per hour, the elimination of the time by electric actuation could not shorten the stop more than 88 feet, while to improve the pneumatic brake from the worst to the best now in service, will shorten the stop 500 feet, and by adding electric transmission 600 feet.

Whichever phase of the situation is being considered, it will be seen that actuating compressed air brakes electrically cannot fail to produce a very marked improvement in train operation.

It has long been known that electricity could add to the flexibility and efficiency of a compressed air brake, but, so far as steam road equipment is concerned, there are four chief reasons why it has not heretofore been employed for this purpose:

First. Electric current has not been available without special provision being made for it.

Second. We have not had sufficient knowledge or material at hand to insure a reliable current and connections.

Third. Because the present air brake has been sufficiently flexible and near enough to being simultaneous for the conditions up to quite recently.

Fourth. That the pneumatic brake had not been brought to such a degree of perfection as would warrant the application of electricity to it.

(1) Now, however, current is available on practically all the steam trunk lines, as well as on electric railway and steam road electrifications, as nearly all first class trains are lighted by electricity.

(2) Now the art has developed into a science, in that reliable information and data are at hand with which to make practicable applications, and jumper connections have been brought to such a state of simplicity and reliability that there is no longer need for fear in these respects.

(3) As affecting the action and results of the operation of the pneumatic brake, at least two serious changes in conditions have occurred:

First—Heavier vehicles.

Second—Longer trains.

In addition to this, time has become much more important than heretofore, because (1) by congestion of traffic, particularly adjacent

to large cities, and (2) because the time lapse as a factor in controlling trains composed of heavy vehicles with the pneumatic brake has become quite serious.

The time element in the brake operation is very important in two ways. In one, it is very necessary, and in the other very undesirable. First, for service operations a time interval is necessary in some steps of the operation; for instance, while it is important that the brake commence to apply on each vehicle of a train simultaneously, it is equally important that the development of the force be obtained gradually, and both these for the same reason, namely, the elimination of damaging shocks and discomfiting surges to or in the train. The simultaneous application prevents the slack from first running in and then out, and so on; while the slow rise of cylinder pressure prevents a too sudden and rapid change of motion, that is, deceleration, with its consequent disagreeable effect upon the passengers. In emergencies, the time element is very undesirable, as to stop is then the only consideration, the requirements being that the consequences be less disastrous than if the accident had not been avoided.

With regard to time, so far as traffic is concerned, every second saved between stations means an increase in the number of passengers it is possible to carry on the same track, as well as a reduction in the schedule time, more trains possible in the same time, and consequently greater realization of the object of running a railroad.

With regard to the time affecting results of pneumatic brake operation, this is manifested with long trains in the increase of time necessary to get the brake applied, and by shocks and stresses, due to the different designs of brake apparatus, or forces at the front and rear of the train at the same instant, and the more rapidly it is attempted to apply the brakes (when rapidity does not include simultaneous action) the greater will be the shocks and stresses. Moreover, when passenger rolling stock has been brought to its present state or condition for the comfort of travelers, any shortcomings, or lack of improvements in this respect, stand out very prominently by contrast, and this is particularly true of what is probably the only remaining two improvements to be made in modern trains, namely, the discomforts produced by the starting and stopping of these trains.

The application of electric current to the brake will not only eliminate the shocks and surges that occur with even the present slow service rate of brake application, but will permit of the application being made more rapidly throughout the train as a whole; this, as above mentioned, being the equivalent of much more efficient motive power.

With regard to the fourth proposition or assertion, namely, that the pneumatic brake has not until recently reached such a stage as would warrant its being actuated electrically, I may say that electricity would not in any sense add to the braking force, its purpose being to produce simultaneous operation; the application of the brake, in other respects, being identical with the ordinary pneumatic operations. The chief purpose in adding electricity to a pneumatic brake is to instantly transmit the intent of the engineer or operator to each vehicle of the train, thus eliminating the time element, and other things being equal, all shocks and stresses, both in service and emergency, and in emergency, to shorten the stop somewhat by producing instantaneous application of the brakes on all vehicles in the train.

In the last year or two, vehicles have become so large and heavy and trains so long because of large locomotives that the time element between the application and release of the brake from the engine to the last car has become a quite serious factor, since it permits the slack to run in or out, as the case may be, producing discomfiting and some-

times dangerous shocks. Operating the service brake electrically under such conditions then will eliminate this, while, in emergency, it will serve the twofold purpose of preventing shocks and shortening the stops. The retarding force, it must be understood, comes solely from the pneumatic portion of the brake, and until such a brake is installed that will produce the maximum emergency retardation desired or permissible, actuating the brake electrically will not only be a very expensive way to seek improvement, but will be far inferior in results to what could be done pneumatically.

It may be sufficient to state that adding electric operation to the old brake, while it will improve matters wonderfully so far as comfort is concerned, yet it will not compare with what can be done with the strictly pneumatic brake in the matter of stopping force. As the pneumatic brake is now sufficiently developed to warrant the application of electric control and transmission, it reduces to simply a question of expense and wisdom.

Features of the Electro-Pneumatic Brake.

It may be well now to show some of the electro-pneumatic advantageous features and to emphasize the importance of improving the pneumatic brake to its highest degree, before adding electric features, by a few cuts illustrative of the characteristics of the various improvements or changes in results.

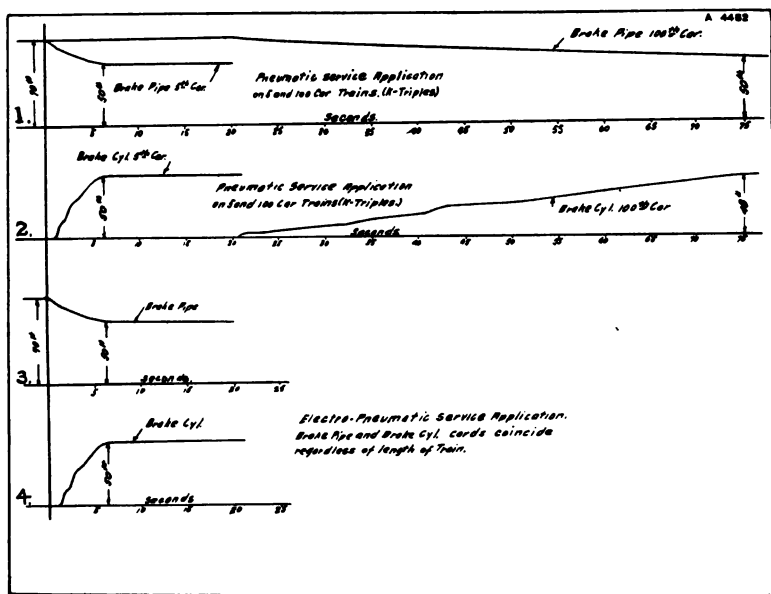


Fig. 4

Fig. 4 shows four diagrams. Diagram No. 1 illustrates the great difference in the rate of brake pipe reduction between a 5-car and a 100-car train when making a pneumatic service application. Comparing the results obtained from the two trains, it will be seen that with the 5-car train the brake pipe reduction started immediately, and in 6 seconds time a 20-pound reduction was obtained; while with the 100-car train it required 20 seconds time to start the reduction and 75 seconds to obtain a 20-pound reduction.

Diagram No. 2 shows the rise in brake cylinder pressure resulting from the brake pipe reduction shown in Diagram No. 1, and is proportional thereto.

Diagram No. 3 shows the drop in brake pipe pressure.

Diagram No. 4 shows the rise in brake cylinder pressure resulting from an electro-pneumatic service application. Since the electro-pneumatic operation is simultaneous, the same brake pipe and brake cylinder cards would be obtained on every car in the train, regardless of the length of the train.

The advantages of the electro-pneumatic equipment are clearly shown here, as the time element is entirely eliminated, resulting in all cars starting to do their share of braking simultaneously.

This simultaneous action of the brake eliminates the disastrous results due to slack between the cars running in and causing shocks.

Fig. 5 shows two diagrams. The upper diagram illustrates an electro-pneumatic service brake application, showing the start of rise in brake cylinder pressure in 1.9 seconds and the maximum cylinder pressure obtained in 5.5 seconds, and all brakes applying simultaneously.

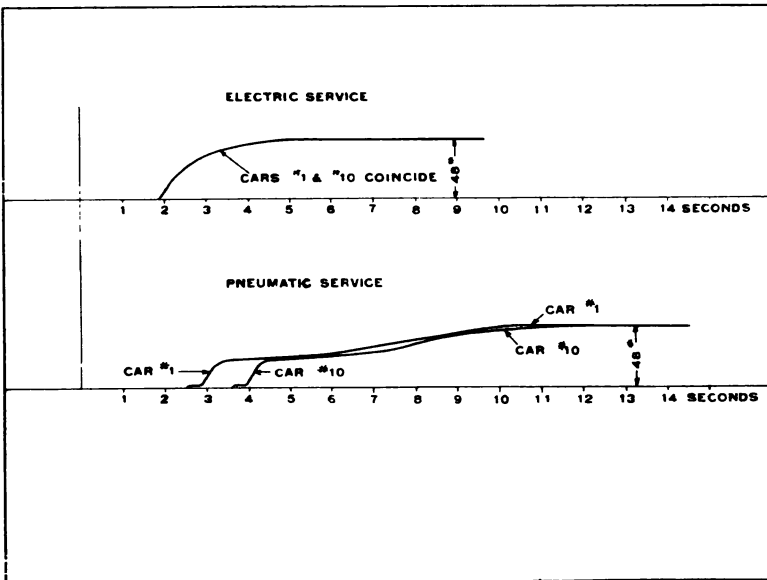


Fig. 5

Owing to the simultaneous action of the brakes throughout the train, the braking power can be developed in a short time without discomfort to the passengers.

The lower diagram shows the results obtained from a pneumatic service brake application on a 10-car train. The time for starting the rise in brake cylinder pressure is shown as 2.75 seconds, and the time for obtaining the maximum brake cylinder pressure was 11 seconds. The difference in time between the first and tenth cars, in start of rise in brake cylinder pressure, was one second.

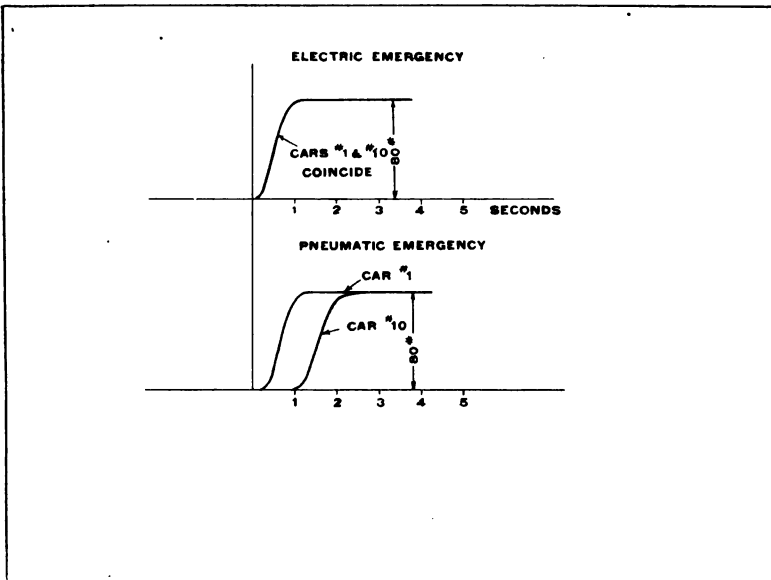


Fig. 6

Fig. 6 shows two diagrams. The upper diagram illustrates the results obtained from an electro-pneumatic emergency application on a 10-car train.

The lower diagram shows the results obtained from a pneumatic emergency application on a 10-car train.

Comparing these diagrams, it will be seen that the only difference is in the time of transmission, and is all that should be claimed for the electric feature of the apparatus for emergency operation.

Fig. 7 shows two sets of curves. The upper curves illustrate the results obtained from a pneumatic emergency application with the "PC" equipment. The maximum brake cylinder pressure was obtained in 2.8 seconds, resulting in a braking power of 180%.

The lower curves show the results obtained from a pneumatic emergency application with a double "PM" equipment (a complete brake equipment for each truck). The maximum brake cylinder pressure was obtained in 5.6 seconds, resulting in a braking power of 114%.

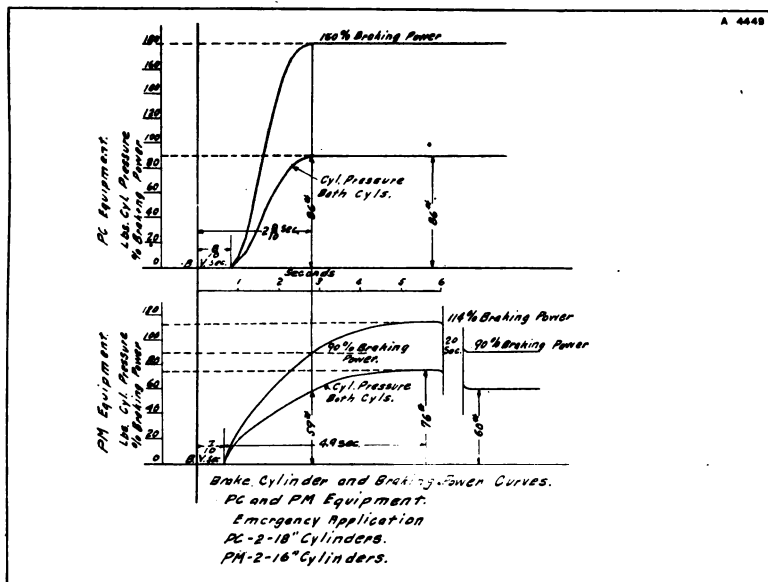


Fig. 7

These curves graphically illustrate the great difference that exists between different equipments, and that greater gain can be had by improving the pneumatic portion of the brake than by adding the electric features to the old equipment.

Comparing the work done by the two equipments, I will consider the stopping of two 10-car trains running at 60 miles per hour, the energy in these trains being 120.4 foot tons per ton weight. The train equipped with "PC" equipment will stop in 575 feet shorter distance than the train equipped with the "PM" equipment. If the train having the "PM" equipment had the electric features added, without any other improvement, the stop would be shortened only about 70 feet; therefore, the stopping distance would still be 500 feet longer than with the train equipped with the latest improved automatic features ("PC" equipment). This, because adding the electric features merely eliminates the time of transmission, the greater benefit being prevention of serious shocks and break-in-tuos.

Air Brake Development.

Natural improvements, combined with the effort of railroad companies to attract business by superior equipment, and the demand of the traveling public for greater comfort when traveling, shorter schedules (higher speeds), and, at the same time, greater safety, has led to the development of heavier rolling stock. These cars and locomotives are of such weight that they cannot be as efficiently braked with the older type of air brake equipment as could the rolling stock of years gone by;

and this is particularly true of emergency applications, as because of the very high speeds attained and the large cylinders necessarily employed the time element in the attainment of cylinder pressure, and the lowered brake shoe friction (by reason of the tremendous energy per brake shoe to be dissipated), means that the stopping distance, with the brake equipment remaining the same as with the rolling stock of previous years, is lengthened out several hundred feet. Obviously, therefore, if equal safety is to be maintained and the schedules operated profitably, at least as high (relative) a rate of retardation must be provided as heretofore.

It has already been pointed out that actuating the brakes electrically results merely in the elimination of the time element of application, the retarding force coming solely from the pneumatic operation, and that adding electric control without first developing the pneumatic features to a high degree is an expensive way of seeking improvement.

Not only this, but the heavier vehicles and longer trains have vastly increased the energy to be dissipated and magnified the time element necessarily involved in so doing. It is imperative that if the same relative freedom from surges, shocks, and stresses is to be retained, the brake control must be much more flexible and responsive than has heretofore been the case.

With this end in view, great improvements have been made in the purely pneumatic brake, but full attainment is only possible when the pneumatic brake is operated electrically, as by this means the time element between the first and rear of train is reduced, and the degree of retardation best suited to speed can be measured to a degree.

As intimated in the commencement of the paper, this has long been known, for it is obvious that with any class of rolling stock or make-up of train that the elimination of the time element of brake operation will be both an improvement in this respect and also in the degree of perfection required in the human agents in its manipulation.

Coincident, however, with the other advancements, electric lighting of trains coming into existence, and its almost universal use on trains of such car equipment, has given an opportunity of an electric pneumatic system of brakes for the control of even "steam road" trains.

This, as far as time will permit, covers the chief considerations and antecedents to the design or installation of an electro-pneumatic brake, but I believe all of you will appreciate a few illustrations of how the design is worked out. Therefore, I will illustrate what I have to say further with slides showing the electric attachments to the pneumatic parts of an air brake.

(At this point, slides were thrown upon the screen and Mr. Turner briefly pointed out the chief characteristics, constructional and operating features, etc., of the various equipments, this explanation being the basis of the somewhat more elaborate description of the following sections.)

The "P M" Equipment.

Before passing to the description of the latest and most highly developed equipment, it is advisable to examine briefly the equipment which was their predecessor and to note some of the features, now regarded as highly desirable, impossible of attainment with it.

Fig. 8 illustrates the old quick action triple valve used with this early equipment. Familiar to all as the "P" Triple, it is a valve which gave satisfactory service for many years, but has now become inadequate on account of changed conditions. The design of this valve is

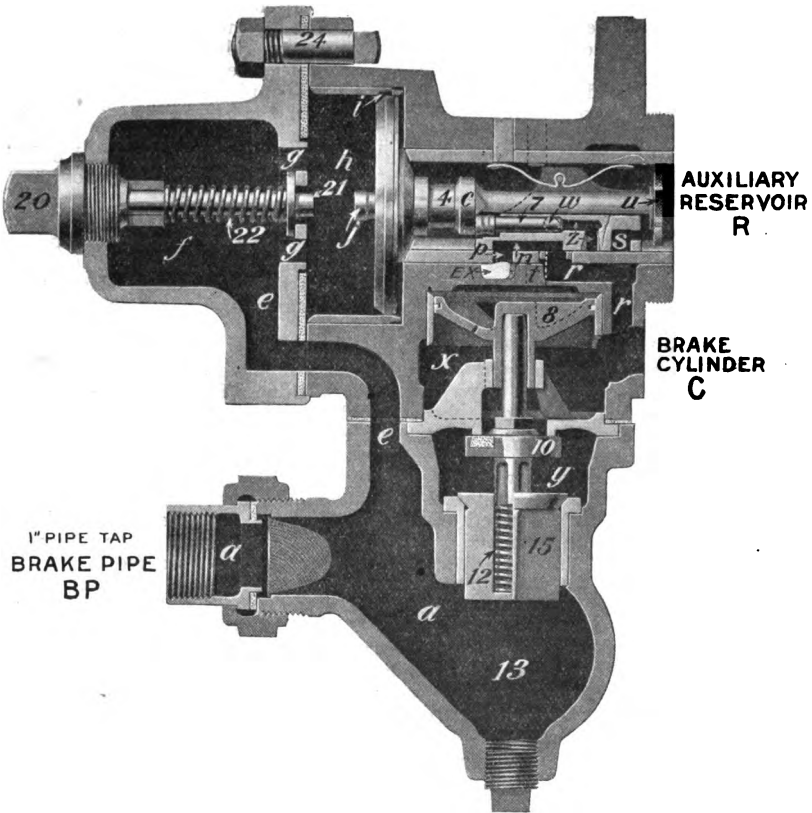


Fig. 8

such that an increase in braking force can only be secured by an increase in the brake pipe pressure carried, that is, increase the pressure from 70 to 90 or 110 lbs. or even higher, the braking force then secured being directly proportional to the increase in pressure. No provision whatever is made for securing an emergency application following a service application, a feature now considered essential to a good brake. Neither is there any provision in the valve itself for increasing the braking force in emergency over that of service, absolutely necessary if a short stop in an emergency is to be secured. Graduated release, quick recharge, automatic emergency application on depletion of brake pipe pressure are all features to which it is impossible to adapt the design of the "P" Triple.

Very little could be added to the efficiency of such an equipment by attaching the electric features, for only the time required to start a brake application would be saved. This time is not very much, in fact it is but a small portion of the time of the entire stop. Consequently, to cut out this time is to shorten the stop by but little. But if the road

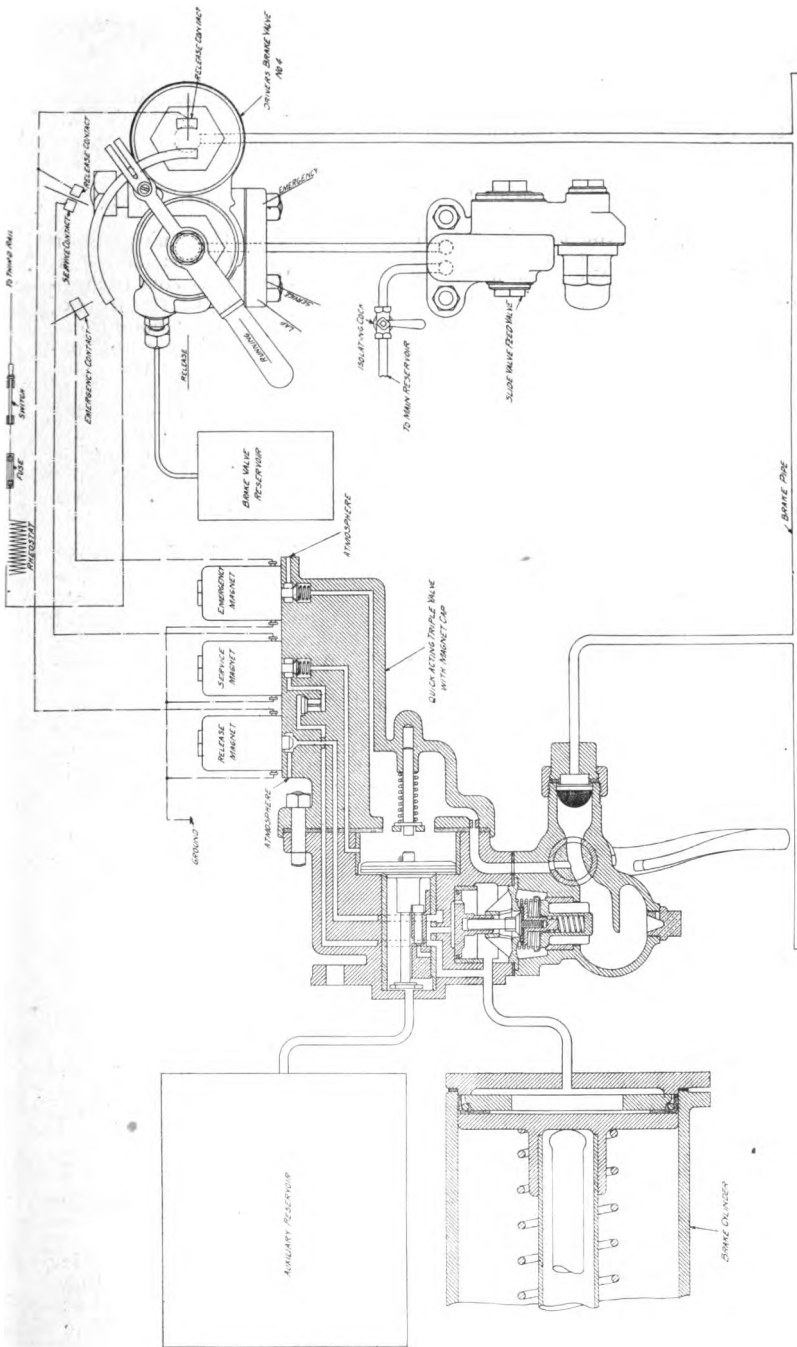


Fig. 9

conditions are such that rough handling can not be avoided and these conditions cannot be bettered, then the operation of the road will be materially improved by the addition of electricity.

Electric Attachments to Quick Action Triple Valve.

Fig. 9 shows the electric attachments added to the quick action triple valve, that is, to the type of valve whose limitations have just been pointed out. No attempt is made here to gain any saving in stopping distance except that incident to the slight saving in the time of transmitting braking action throughout the train. Under conditions, however, where the stops are very rough, adding electric control materially reduces the shocks and thereby decidedly improves the operation of the brake. This, we never have attempted and never would attempt, in this country, for here electric control has always been added to improve the operation of the pneumatic brake. But last year a number of English engineers came to this country to observe the operation of the electro-pneumatic brakes as used in many of our cities and were so satisfied with the operation, that they decided to add electric control to their old triple valve for use on some electrifications in London.

Fig. 9 shows how we were able to add electric control to this triple valve. The system is simple, consisting of three magnets, service release and emergency added to the valve itself and a contact mechanism added to the engineer's brake valve. This contact mechanism is such that the engineer uses the same positions on the brake valve to operate either pneumatically or electro-pneumatically. To apply the brake, the engineer moves the brake valve handle to service position, which energizes the service magnet which is connected directly to the brake pipe. Brake pipe air is thus allowed to escape to the brake cylinder through the service magnet valve and the brake is consequently applied precisely as though the brake pipe reduction had been made with the engineer's brake valve. Venting the brake pipe air to the brake cylinder obviously results in a somewhat higher pressure than is secured in pneumatic operation. Venting the brake pipe air in this way also has the decided advantage of preventing a reduction in brake pipe pressure below that necessary to secure equalization, for, of course, as soon as the pressure in the brake cylinder becomes equal to that in the brake pipe, there can be no further flow of air or it is impossible to make an over-reduction. When the engineer moved the brake valve to service position he energized the release magnet as well as the service magnet. But by moving the brake valve handle to release position, he deenergizes the release magnet and is thus enabled to secure graduated release. For by moving the brake valve to release, he forces the triple valve parts to release position pneumatically and, the release magnet being deenergized, permits brake cylinder air to escape to atmosphere. By moving the brake valve to running position, he energizes the release magnet and closes the passage from the brake cylinder to atmosphere. Consequently, alternately moving the brake valve from release to running positions give a finely graduated release. To make an emergency application, the engineer moves his brake valve to emergency position which energizes the emergency magnet. The brake pipe is then open to the atmosphere and the brake applied just as though a pneumatic emergency application had been made.

There is one important feature to be noted in connection with this valve, for without this, or some other arrangement to secure the same result, no electro-pneumatic brake can be a success. It is well known that if a reduction is made by the equalizing piston and brake pipe leakage

exists at the same time, the equalizing piston lets out less air than would be the case if there were no brake pipe leaks. Consequently, the rate of reduction is no greater than it would have been if there had been no leaks in the pipe. But an electric magnet is not an equalizing piston; it is simply a hole from the brake pipe to the atmosphere. Evidently, then, if sufficient brake pipe leakage existed, a service rate of reduction could be converted to an emergency rate of reduction and an emergency application secured when only a service application was intended. To prevent this, the passage leading to the emergency magnet is taken off at the point where the piston stops when moving to service position. Consequently, if it tends to travel any further, due to the rate of reduction being too rapid, because the brake pipe leakage assists the reduction made by the magnet, the passage to the magnet is connected to the auxiliary reservoir side of the piston. The auxiliary reservoir pressure, instead of the brake pipe, is then reduced, which, of course, causes the piston to travel back and thus absolutely prevents it from going to emergency position. To conclude, I will say that this is a rather simple way of attaching the electric features to a pneumatic brake and serves only to eliminate the roughness in train handling.

The "PC" Equipment.

Passing to the application of electric control to highly developed pneumatic brakes, I will first take up the "PC" equipment and will describe, in a somewhat general way, its pneumatic operation and will then show how the addition of electric control affects this operation.

Fig. 10 is a photographic view of the control valve, employed with the "PC" equipment and illustrates the arrangement of the various parts, as well as the general appearance of the valve. Fig. 11 is a diagrammatic drawing which makes clear the internal arrangement of the parts of the control valve. It can be seen that the control valve is made up of four portions: (1) the Equalizing Portion; (2) the Application Portion; (3) the Emergency Portion; and (4) the Quick Action Portion.

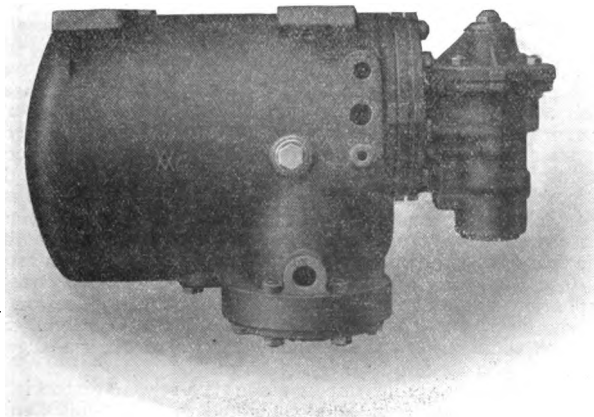


Fig. 10

The "P" Triple valve, which has been described, is of relatively simple construction and consists of but few parts, but this simplicity is only possible because of the few functions which it performs. A brake to control adequately the modern heavy high speed trains, must possess many functions not capable of realization with the "P" triple, and this accounts for the greater complexity and increased size of the control valve. Thus the equalizing portion is required that it may be affected by the variation in brake pipe pressure and consequently set in motion whatever other parts may be needed to secure the function intended. The application portion controls the flow of air to and from the brake cylinder in service operation and since this is its only function, may be so designed as to secure and maintain the desired cylinder pressure regardless of the piston travel or cylinder leakage. The emergency portion controls the flow of air from the emergency reservoir to the emergency cylinder (in the "PC" equipment, two cylinders are employed, one in both service and emergency and the other in emergency only) and thus permits the use of an emergency reservoir and cylinder, whose operation is unaffected by the movement of parts in service operations. The quick action portion, as in the ordinary triple valve, vents brake pipe air to the atmosphere in emergency. But unlike the ordinary triple valve, the quick action parts are not so directly controlled by the service parts and the likelihood of undesired quick action is thus made remote.

As no attempt will be made to trace the operation of this valve in great detail, those desiring a more complete knowledge of its operation are referred to Instruction Pamphlet No. 5045, published by the Westinghouse Air Brake Co. Some of its more important features will, however, be pointed out, the reason for their incorporation in the control valve given and the means by which they are secured briefly explained.

Operation of the "PC" Equipment.

The "PC" equipment was designed that the long, heavy, modern trains might be stopped from 60 M. P. H. in 1,200 feet. In order to accomplish such a stop, it is necessary that a high retarding force be developed in a very short time, for as I have previously pointed out to you this evening, each second's delay in applying the brakes, at a speed of 60 M. P. H., adds 88 feet to the length of stop. A high retarding force demands a high cylinder pressure which in turn requires that a large volume of air at the highest practical pressure, be used in each application. To permit this large volume of air to flow to the brake cylinders in the least time, large and direct air passages are essential. Such passages are secured in the control valve by the employment of a distinct application portion. A sufficient brake pipe reduction causes first the release piston and then the equalizing piston to move to service position. With the equalizing slide valve in service position, communication is made from the pressure chamber to the application chamber and chamber C (see Fig. 11). Pressure chamber air flowing to chamber C with atmospheric pressure in chamber M, causes the application piston to move to the right and thereby open the application valve. Service reservoir air can then flow to the service cylinder through a large direct passage and thus quickly build up its pressure.

When an emergency application is made, the release piston is moved to such a position that chamber P is connected to the atmosphere. The unbalanced pressure of the emergency reservoir air in chamber R then forces the emergency piston to emergency position, which connects the emergency reservoir to the emergency brake cylinder through a short passage. The maximum cylinder pressure is thus quickly attained in

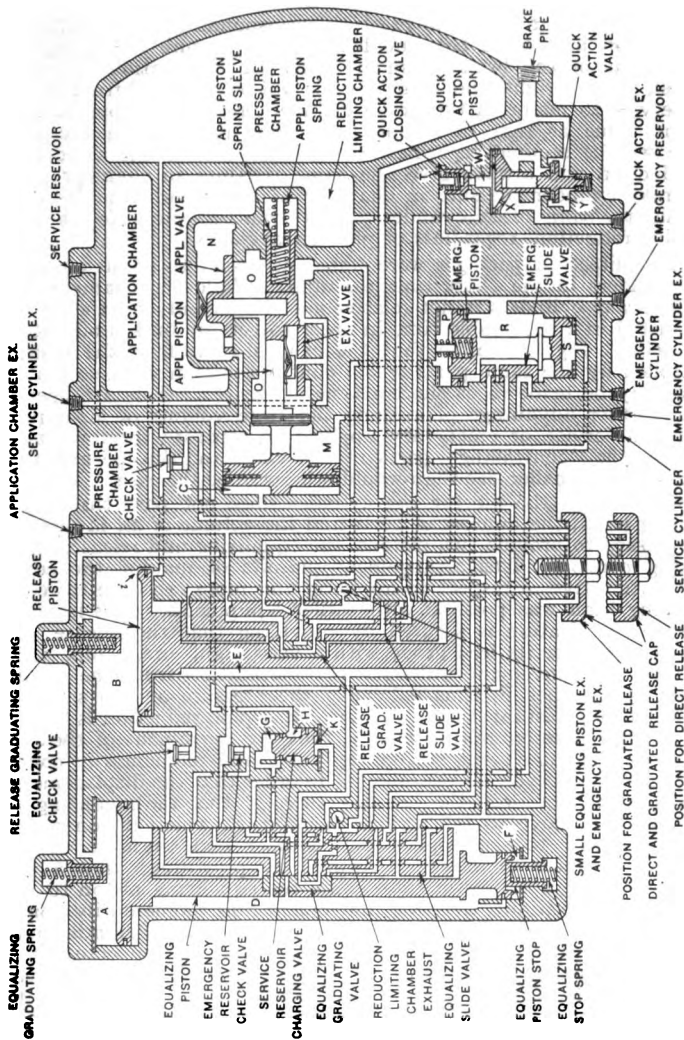


Fig. 11

the emergency brake cylinder also. Thus, it is evident that the design of the control valve is such that very high pressures are realized in the brake cylinders in a very short time.

This design also permits of the maintenance of brake cylinder pressure, as well as the securing of a predetermined cylinder pressure for a given brake pipe reduction, regardless of the piston travel. For the construction of the application chamber and chamber C is such that

no leakage from them can take place, which insures that the pressure in chamber C will remain the pressure corresponding to whatever service reduction may have been made. If the pressure in chamber M, which is that of the brake cylinder, falls, the application piston will be moved to the right and sufficient air will be admitted from the service reservoir to maintain the brake cylinder pressure at approximately the same value as that in chamber C. The predetermined cylinder pressure will be secured regardless of leakage because the same brake pipe reduction will always give the same pressure in chamber C; because brake cylinder pressure in chamber M must always substantially equal this, the same brake cylinder pressure will be secured for the same brake pipe reduction, regardless of piston travel.

Large, direct air passages were stated necessary to admit air to the brake cylinders in the short time essential. While the exhaust of air from the brake cylinders is not relatively so important, yet the air must be exhausted in a reasonable time in order to get the brakes off without undue delay. Fig. 11 shows that the exhaust of air from the cylinders is controlled by the same parts which control the admission, so that the exhaust may be made in as short a time as desired. This arrangement has the further advantage of keeping the large volume of air required for either a service or emergency application separate from what may be termed the "controlling" parts of the valve and thus permits these to be of a much smaller size than would otherwise be the case.

Even though the air for the cylinder does not pass through the controlling parts, the number of ports and the volume of air is such that it is necessary to provide two pistons, the equalizing and release, for the equalizing portion. This arrangement permits of making the control valve less sensitive in respect to applying and more sensitive in respect to releasing than was possible with earlier equipments. The less sensitiveness to application is secured by providing that the release piston will move and close its feed groove with a very slight brake pipe reduction; that this movement will open communication from the pressure chamber to chamber F, thus balancing the pressure on the small end of the equalizing piston; that a greater brake pipe reduction is then required to move the equalizing piston; that the movement of the equalizing piston shall move the graduating valve and momentarily connect the emergency reservoir to chamber D in order that the displacement of the piston shall not drop the pressure therein; that the equalizing slide valve will then move to full service position, in which it connects the pressure chamber to the application chamber and chamber C. The greater sensitiveness to release is secured by providing; that a slight increase in brake pipe pressure will cause the equalizing piston to move toward release position; that this movement will momentarily connect chamber E to the atmosphere and thus increase the differential acting on the release piston; that chamber F will also be connected to the pressure chamber by this movement so that the equalizing slide valve cannot fail to momentarily connect chamber E to the atmosphere; that when the release piston has moved to release position—which connects the application chamber and chamber C to the atmosphere and thus releases the brake—chamber F will be connected to the atmosphere and the equalizing piston forced positively to release position.

Certainty of release is also secured by delaying the recharging of the various reservoirs from the brake pipe until all the control valves have gone to release position. Curiously enough, this feature is not secured at the expense of a slow recharge, for on the contrary, the valve has incorporated within it a quick recharge feature, which is secured by the same device which provides for the first feature mentioned. When the release and equalizing pistons have gone to full release position, the

pressure chamber, which is at a pressure considerably less than the normal brake pipe pressure, is connected directly to the emergency reservoir, which is at practically the normal brake pipe pressure, with the consequent result that the pressure chamber is charged from the emergency reservoir at the same rate at which the pressure is being restored in the brake pipe. In this manner the pressure chamber is recharged without drawing much air from the brake pipe, the advantage this is in releasing the brakes scarcely requiring emphasis. When the pressure chamber pressure is within 5 lbs. of that in the emergency reservoir, the charging valve lifts and connects together the service and emergency reservoirs and the pressure chamber. Air from the brake pipe can then restore all three to the normal brake pipe pressure. The charging valve is thus designed to prevent the service reservoir robbing the brake pipe of air at a time when it is seriously needed and the connecting together of the pressure chamber and the emergency reservoir by the release and equalizing slide valves affords a quick recharge.

This latter feature also permits of obtaining a graduated release since, if the brake valve be lapped, the pressure in chamber E will become greater than that in chamber B, since chamber E is supplied from the emergency reservoir. The greater pressure in chamber E forces the release piston to graduated release lap position in which the outlet from chamber C to the atmosphere is closed and consequently pressure held in the brake cylinder. Provision is made for cutting out the graduated release feature by turning a cap to "direct release position." The pressure chamber is then charged directly from the brake pipe, thereby making it impossible to secure a higher pressure in chamber E with which to force the release piston from full release position.

While provision is thus made for a graduated release, provision is also made for a prompt release. If the engineer would continue reducing the brake pipe pressure after the pressure chamber had equalized with the application chamber, the pressure in chamber E would become considerably greater than that in chamber B and this excess would have to be built up in the brake pipe before the brake could be released. To prevent this, if a brake pipe reduction is continued after the pressure chamber has equalized with the application chamber, the equalizing piston moves to what is called "the over-reduction position" and connects the pressure and application chamber to the reduction limiting chamber, which is at atmospheric pressure, and thus reduces the pressure in chamber E with that in chamber B. If the brake pipe reduction is continued after the pressure and application chambers have equalized with the reduction limiting chamber, the release piston will travel to its emergency position and thus connect chamber P, at the back of the emergency piston, to the atmosphere. The emergency reservoir pressure in chamber R will force the emergency piston to emergency position and thus connect the emergency reservoir to the emergency brake cylinder. The service brake, it will be remembered, has already been applied by the brake pipe reduction made. The movement of the release piston to emergency position connects chamber W to the emergency reservoir and thereby permits emergency reservoir air to force the quick action piston downward and to vent brake pipe air to the atmosphere. The obvious consequence is that quick action is started throughout the train. Hence, any depletion of brake pipe pressure below a predetermined point, without regard to how it may be brought about, will cause an emergency application of the brakes.

It will be evident that the full emergency braking power can be secured at any time, irrespective of whether a service application preceded, in the same manner in which an emergency application is brought about upon the depletion of brake pipe pressure. This is a feature which

was first embodied in the "PC" equipment, although it is extremely valuable, considering the brake as a safety device.

Addition of Electric Attachments to the Control Valve.

It has been my endeavor in the foregoing to explain the pneumatic operation of the control valve and I shall now attempt to explain how this operation is affected by the addition of electric control.

Fig. 12 shows the control valve with the electrical attachments complete. Essentially the operation of this electric control is no different from that which has been previously described. There are three magnets, service, release and emergency and a quick action switch, and in addition, a simple contact mechanism must be added to the H-6 brake valve. To make a service application, the engineer moves his brake valve to the regular service position and thereby energizes the service magnet, which opens the service magnet valve. The opening of the service magnet valve has placed the brake pipe in direct communication with the brake cylinder by a passage leading from chamber B to the brake cylinder through the service magnet. There are two reasons for venting the brake pipe to the brake cylinder, first, it limits the possible brake pipe reduction to that necessary to secure the full service braking force, and,

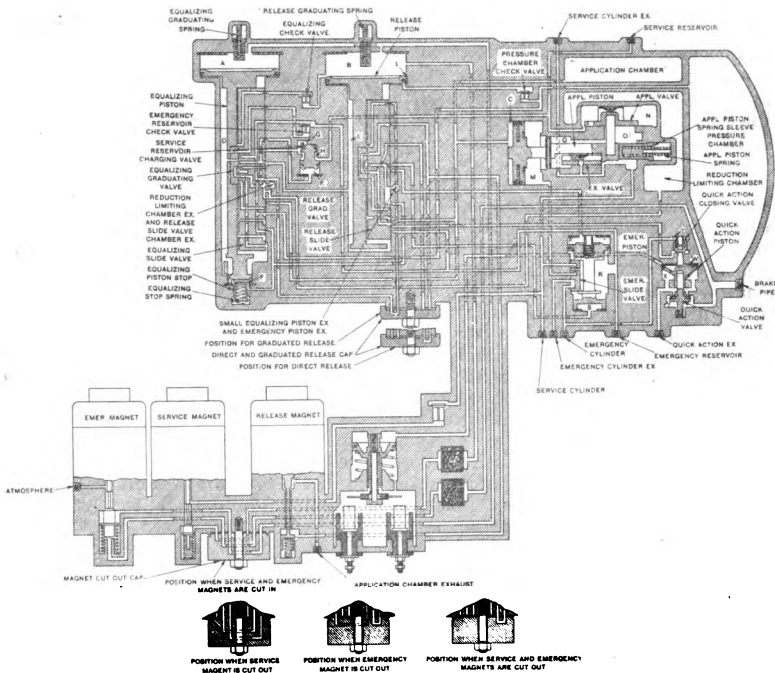


Fig. 12

second, by the insertion of a choke in the passage, it enables the limiting of the rate of reduction to that of service. The brake pipe pressure reducing into the brake cylinder, the brake is applied as has been heretofore described.

To release the brake, the engineer moves his brake valve to release position which energizes the release magnet, lifts the release magnet valve and closes the application chamber exhaust passage. Meantime, the various parts of the valve move to release and charging position as in pneumatic operation. So long as the engineer's brake valve is in release position, the brakes cannot be released, for the pressure in chamber C cannot reduce. But by moving the brake valve to running position, the release magnet is deenergized and the passage from chamber C to the atmosphere opened. The pressure in chamber C is then reduced and the brakes released. A graduated release is secured by alternately moving the brake valve from running to holding position, since in holding position as in release, the release magnet is energized.

To make an emergency application, the engineer moves the brake valve to emergency position, which energizes the emergency magnet and thus opens the brake pipe to atmosphere. The emergency parts move to their emergency position, as described in pneumatic operation and produce an emergency application of the brakes. If a hose bursts, etc., the first car affected goes to quick action pneumatically and thus closes the quick action switch. The closure of the quick action switch energizes the emergency magnets throughout the train with the consequent emergency application. So much for the "PC" equipment.

The "UC" Equipment.

The "UC" equipment, which embodies essentially the same features as the "PC" equipment, has but recently been developed and differs from the "PC" equipment, in that it employs a universal valve and not a control valve, the universal valve being so called because it is designed to be of universal application. Some installations require a brake which possesses all the features found in the most elaborate brake, others require a brake which is simple in the extreme, but to all of these the universal valve may be adapted. That is, the universal valve, with the proper modifications, may be used as a brake of the highest order, of the lowest order, or of any intermediate order. The modifications may be readily added, for the universal valve is made on the unit system or built up to secure whatever features are required. Thus to secure an automatic brake but without quick action, only the so-called equalizing portion is needed; if quick action in addition is desired, the quick action portion is added; if it is desired to have quick action available at any time, a high pressure cap is added; or if it is desired to operate electrically, the electric attachments can also be added. Such a method of assembling a valve possesses many advantages, chief among which may be mentioned the provision for future extension, since a brake may be installed sufficient for the present service and gradually evolved into a brake of a higher order as the service demands it. Such a valve also gives promise of becoming a common standard because of its adaptability to all conditions and services. Such a valve has decided operating advantages for a damaged part may be easily removed and replaced without removing and replacing the entire valve on the car. It has also the advantage of completely divorcing the service and emergency parts which completely does away with the bane of the railroad man—undesired quick action.

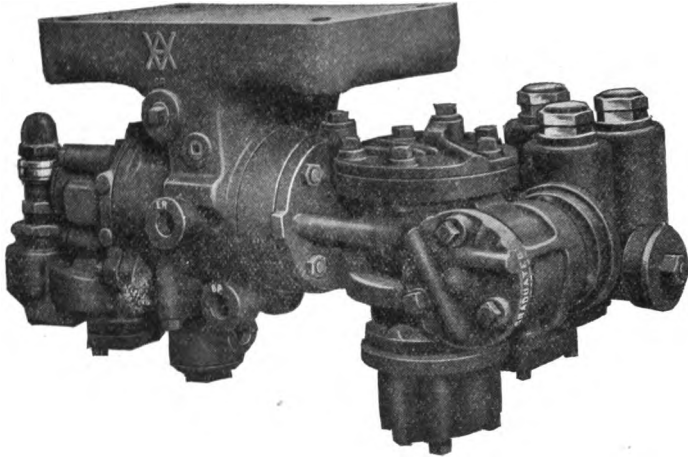


Fig. 13

Fig. 13 is a photographic view of the universal valve and shows the great difference in external appearance of the control and universal valves, a difference which is largely due to the method of construction. The operating mechanism of the control valve is, to some extent at least, contained within the reservoir body, while with the universal valve, the operating mechanism is mounted directly upon this body. Fig. 14 is a diagrammatic drawing of the universal valve and shows the connection between all the ports and passages.

No attempt will be made in this paper to give a detailed account of the construction and operation of the universal valve and those who desire such an account are referred to the Instruction Pamphlet published by the Westinghouse Air Brake Co. The complete universal valve, minus the electrical attachments, is made up of three main parts (1) the pipe bracket, (2) the equalizing portion, and (3) the quick action portion which includes the high pressure cap.

Features of the "UC" Equipment.

The purpose of the pipe bracket is to provide a support to which the other mechanisms may be attached, to permit of the removal of the operating parts without disturbance of the piping and to contain certain small reservoirs. These reservoirs are two in number (1) the quick action chamber which supplies the requisite air to move the emergency piston to emergency position, and (2) the quick action closing chamber which provides the air for holding the quick action valve open in emergency.

The equalizing portion contains all the parts which are concerned in a service application and the quick action portion contains those parts which are concerned only in an emergency application. The equalizing portion contains two pistons, the equalizing and the release, as does the equalizing portion of the control valve and for the same reason, namely, the large volume of air to be controlled. The release piston of the universal valve differs from the release piston of the control valve in that it

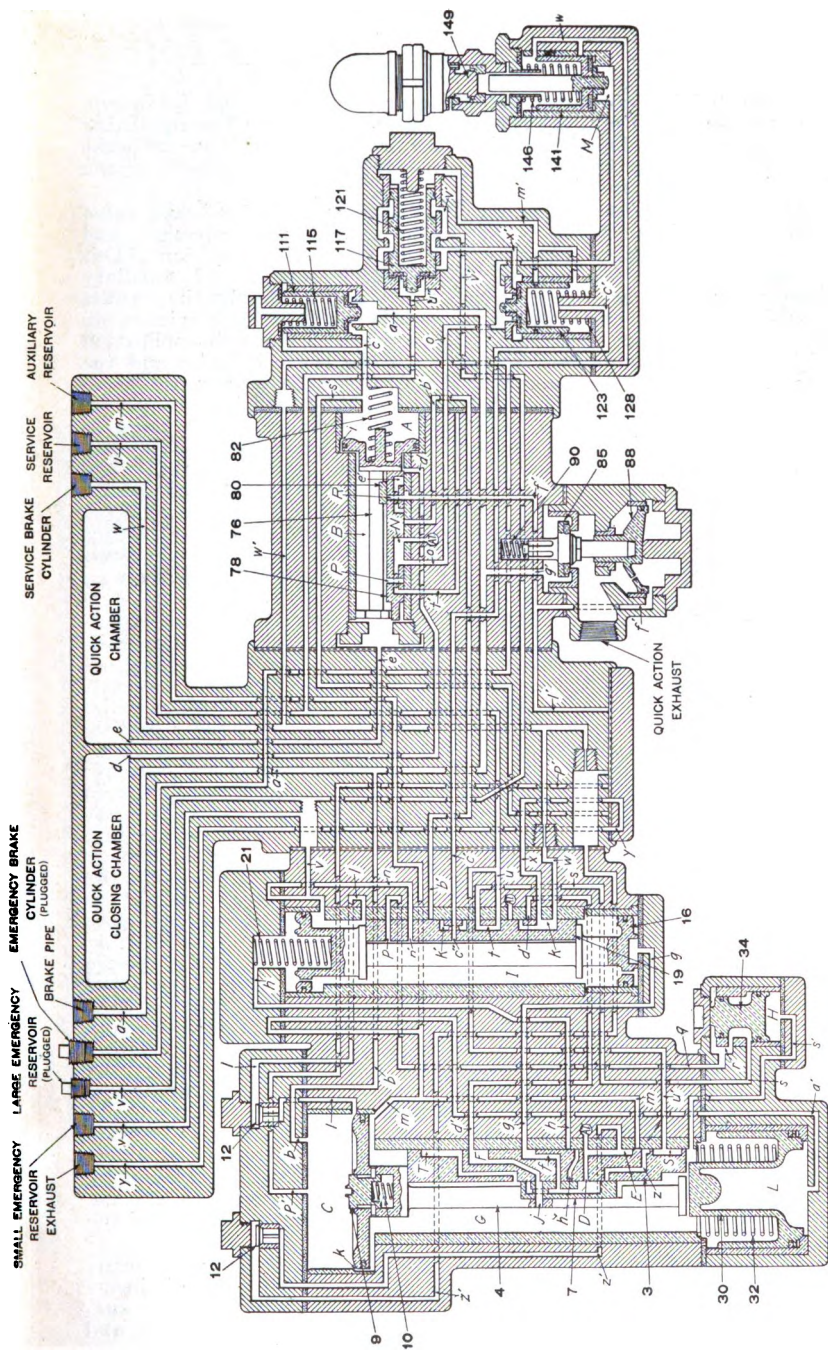


Fig. 14

This drawing does not show the direct and graduated release position but this may be found by referring to Fig. 15

is not affected by variations in brake pipe pressure and its movements are controlled entirely by the equalizing piston. The equalizing piston controls the admission of air to the brake cylinder—but one brake cylinder is used in the "UC" equipment—and the release piston controls the exhaust of this same air.

To make a service application, the engineer moves his brake valve to service position, which reduces the brake pipe pressure and causes the equalizing piston to move to service position. This movement uncovers the service port, allowing service and auxiliary reservoir air to flow to the brake cylinder and apply the brakes and also connects one end of the differential release piston to the atmosphere, which causes the release piston to move to application position and close communication between the brake cylinder and the exhaust. In order that the universal valve may be more sensitive to release than application, the first movement of the equalizing graduating valve opens a connection from a cavity in the equalizing slide valve to atmosphere. This exposes a greater surface to atmosphere and consequently increases the resistance to movement of the slide valve. When the release is attempted, the first backward movement of the graduating valve again connects this cavity to pressure and thus reduces the resistance to movement of the slide valve to its original value. By thus increasing or decreasing the area of the slide valve exposed to atmosphere, the universal valve is made more sensitive to a release than an application.

The employment of a differential piston, controlled by the equalizing piston, for a release piston permits of the incorporation of a graduated release feature simply and effectively. Fig. 14 shows a valve arranged for direct release, Fig. 15 a valve arranged for graduated release. Referring to Fig. 15, it will be noted that the movement of the equalizing piston is prevented by a piston stop, which consists of a tightly fitting piston and a spring. When the pressure in the equalizing piston chamber is reduced by a service application, the emergency reservoir pressure, which is always present in the chamber below the piston stop, forces the stop upward and thereby holds the equalizing slide valve in what may be called its graduating release position. If the brake pipe pressure does not increase, that is, if the brake valve is on lap, the emergency reservoir air flowing into the equalizing piston chamber, will cause the equalizing piston to start toward service position and in so doing to connect the application end of the release piston to atmosphere and close communication between the emergency reservoir and the equalizing piston chamber. The unbalanced pressure thus acting on the release piston causes it to move to application position and close brake cylinder exhaust, thus holding whatever pressure may be in the brake cylinder. If the brake valve is then moved to running position, and the brake pipe pressure thus increased, the equalizing graduating valve will be forced toward release position, which will connect the release end of the release piston to atmosphere and again permit emergency reservoir air to flow to the equalizing piston chamber. The release piston will move to its release position and release the cylinder pressure unless the brake valve is again lapped and the cycle described above repeated. Thus it will be seen that a graduated release is secured by causing the release piston to move alternately from release to application position and by causing this movement through movement of the equalizing graduating valve.

That the brake pipe may not be drained of air to charge the reservoirs until all the brakes have gone to release, a charging valve is incorporated in the universal valve as in the control valve. When the auxiliary reservoir is practically recharged, the charging valve lifts and

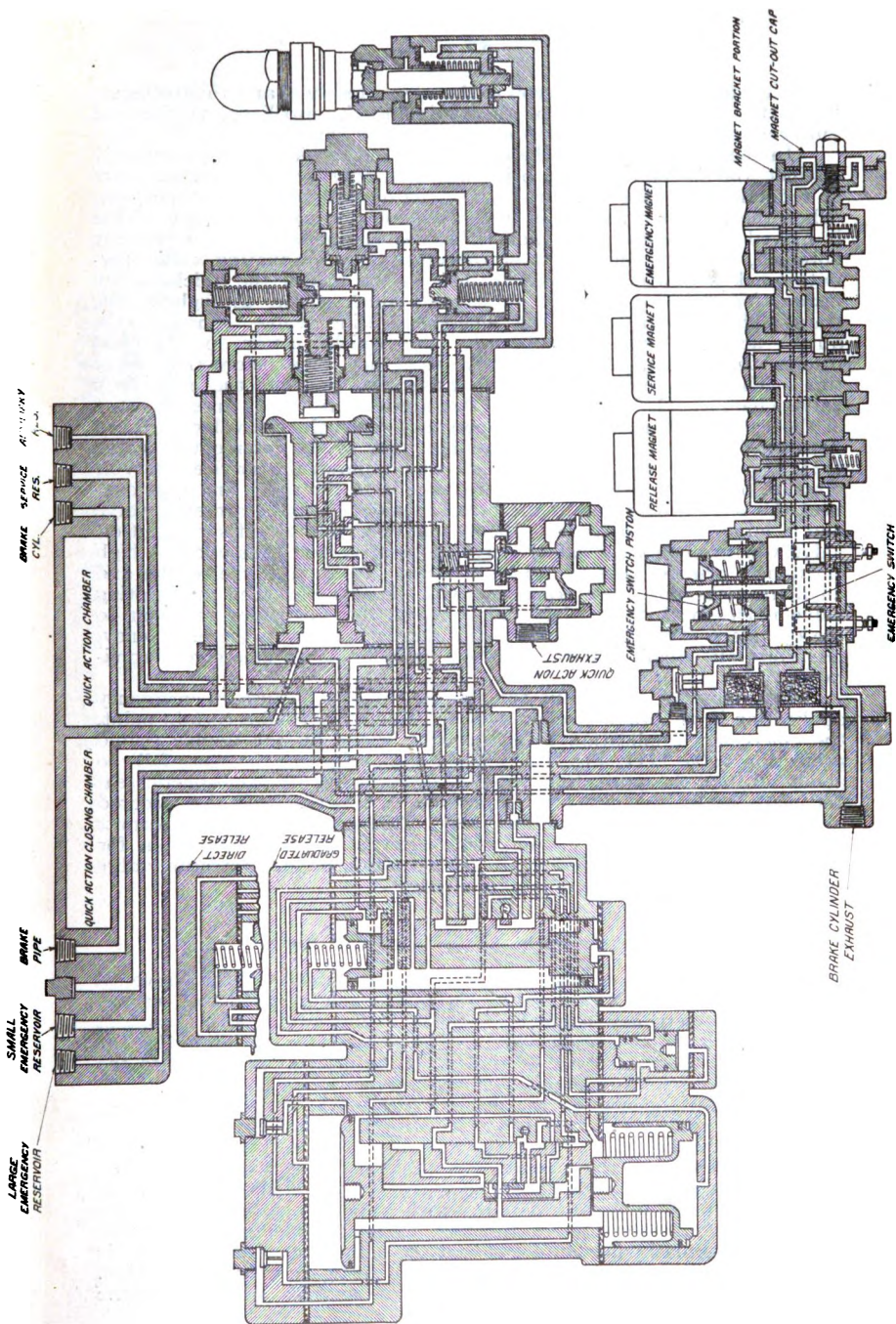


Fig. 15

connects the emergency reservoir to the service reservoir and thus recharges the latter, the brake pipe air then bringing the auxiliary, service and emergency reservoirs up to the normal pressure carried.

In the universal valve, the emergency and service parts are entirely distinct, the emergency parts being operated only by an emergency rate of reduction, so that undesired quick action can be made impossible. When the rate of reduction is that of emergency, the emergency piston is moved to emergency position. That quick action may be readily obtained, the first movement of the emergency graduating valve permits quick action chamber air to flow to the top of the quick action piston, forces it upward and propagates quick action throughout the train. The movement of the emergency slide valve connects the quick action closing chamber to the quick action piston and insures that the quick action valve shall not close before the proper time. The movement of the slide valve also connects the emergency valve chamber (123, Fig. 14) to the atmosphere, and since the top of the valve is connected to the emergency reservoir, the valve is forced downward. This connects the chamber back of the intercepting valve (121, Fig. 14), to the brake cylinder, which allows the service reservoir pressure on the intercepting valve to force it to the right, and thus connect the service reservoir to the brake cylinder by the emergency valve and a large, direct passage. The service reservoir air lifts the cut-off valve which renders the safety valve inoperative and thus allows a high emergency cylinder pressure to be attained. As soon as the service and auxiliary reservoirs have equalized with the cylinder, the intercepting valve moves back to the left and connects the emergency reservoir to the cylinder. Thus the auxiliary and service, and then the emergency, reservoirs all equalize with the brake cylinder in an emergency application.

► The universal valve, like the control valve, will cause an emergency application if the brake pipe pressure is depleted beyond a certain point, the emergency application being brought about by the double seated protection valve (111, Fig. 14). When the brake pipe pressure falls to about 30 lbs., the protection valve is forced from its atmospheric seat and vents brake pipe air to the atmosphere. Emergency is then secured in the manner that has been described. This same feature also permits of securing an emergency application after a service application, for evidently it makes no difference in the operation of the protection valve how the brake pipe pressure has been reduced.

Electrical Attachments of the Universal Valve.

Fig 15 shows the electrical attachments added to the universal valve. As with the control valve, these attachments consist of service, release and emergency magnets, a quick action switch and a contact mechanism on the H-6 brake valve. The electrical operation is also the same as with the control valve, that is, brake pipe air is vented to the brake cylinder by the energizing of the service magnet, the brake cylinder exhaust is opened by the deenergizing of the release magnet and brake pipe air is vented directly to the atmosphere by the energizing of the emergency magnet. The quick action switch is also closed by the same air which opens the quick action valve and thus results in an electric emergency application throughout the train. Without considering these attachments in greater detail, I wish to point out that the moving parts of the universal valve function in electro-pneumatic operation just as in pneumatic operation and that the only effect of adding electric control is to eliminate the time element in instigating braking action. It is evident that such a system is the only permissible one if the electric

**UNIVERSAL EQUIPMENT.
BRAKE CYLINDER CARDS.
ELECTRIC EMERGENCY. RACK TEST**

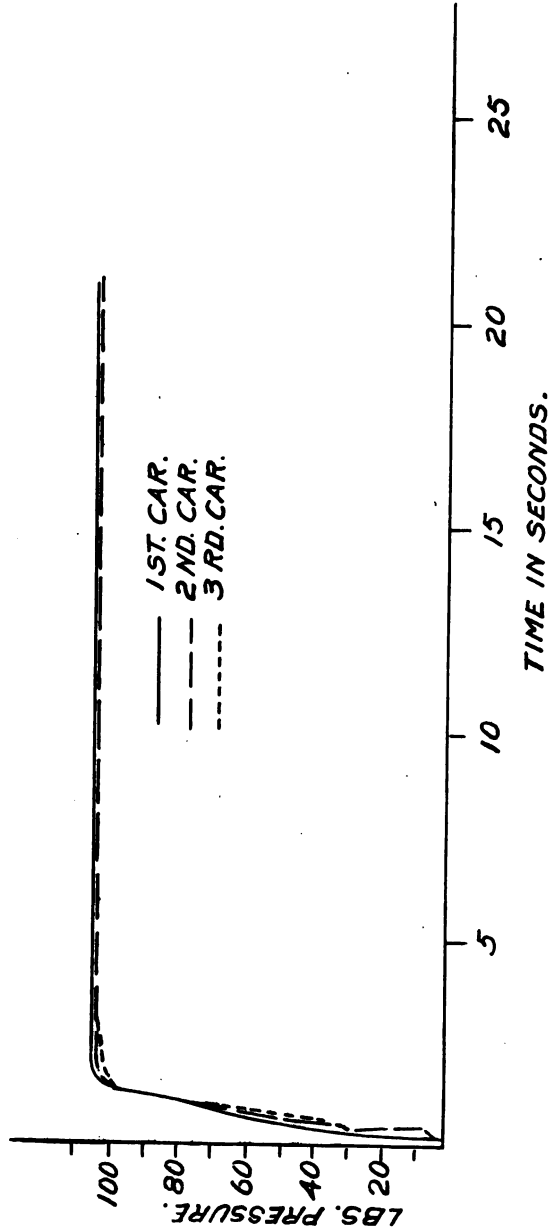


Fig. 16

control does not form a closed circuit, for otherwise, the brake might not respond to the engineer's intention because unknown to him the current had been lost. But with such a system as here described, any failure of the electric control only results in purely pneumatic operation and changes nothing but the time of securing braking action. So much for the universal equipment.

Calculated and Actual Performance.

Confirmatory of what I said at the beginning of the paper, regarding being able to forecast results of a design, I submit Figs. 16, 17, 18 and 19, and some explanatory remarks.

**UNIVERSAL EQUIPMENT.
CYLINDER PRESSURE & BRAKING POWER CURVES.
AVERAGE FOR TRAIN.
ELECTRIC EMERGENCY. RACK TEST.**

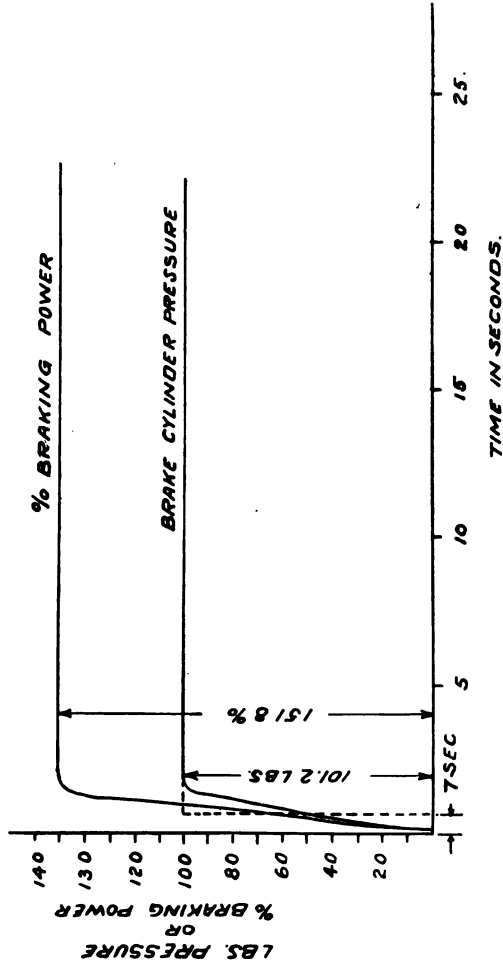


Fig. 17

**UNIVERSAL EQUIPMENT.
TRAIN CURVES.
ELECTRIC EMERGENCY. CALCULATED FROM RACK TEST.**

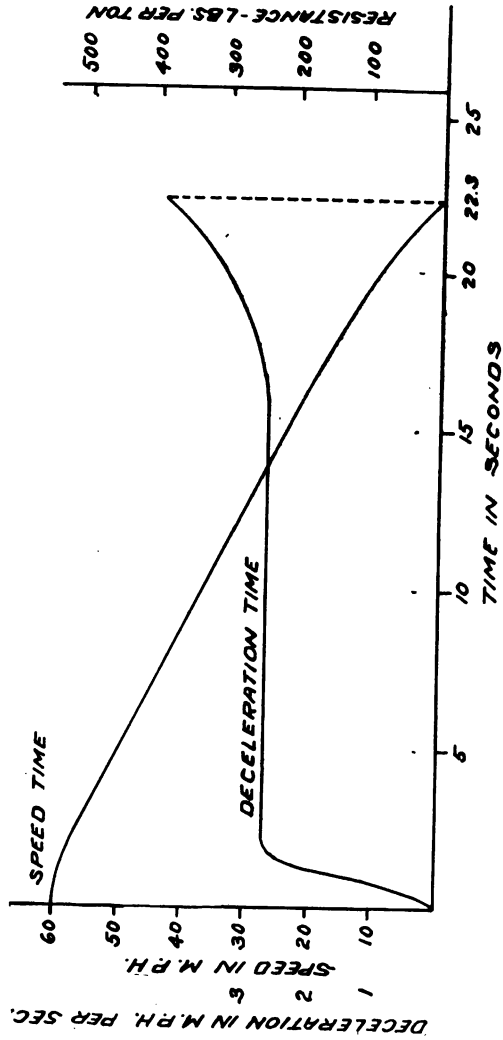


Fig. 18

The following curves and calculations were taken from a preliminary book of curves, data and other information which was made up to show what was to be expected of the brake equipment used on the P. R. R. tests at Absecon, February to May inclusive, 1913.

This example is only one of a series of many that could be taken to demonstrate how closely the actual performance can be predicated from a consideration of the physical characteristics of the apparatus concerned.

The calculated stop (Fig. 18 and Fig. 19) represented by the solid line curve, is based on a rack test of the brake equipment (see Fig. 16 and Fig. 17), and on the data of breakaway stops made during the Lake Shore Emergency Brake Tests of 1909 with a locomotive and cars of like type and having similar foundation brake rigging.

UNIVERSAL EQUIPMENT.

TRAIN CURVES.

ELECTRIC EMERGENCY. ROAD AND RACK TESTS.

— PLOTTED FROM CALCULATIONS MADE FEB. 1, 1913.

--- PLOTTED FROM ACTUAL STOP MADE MAR. 18, 1913

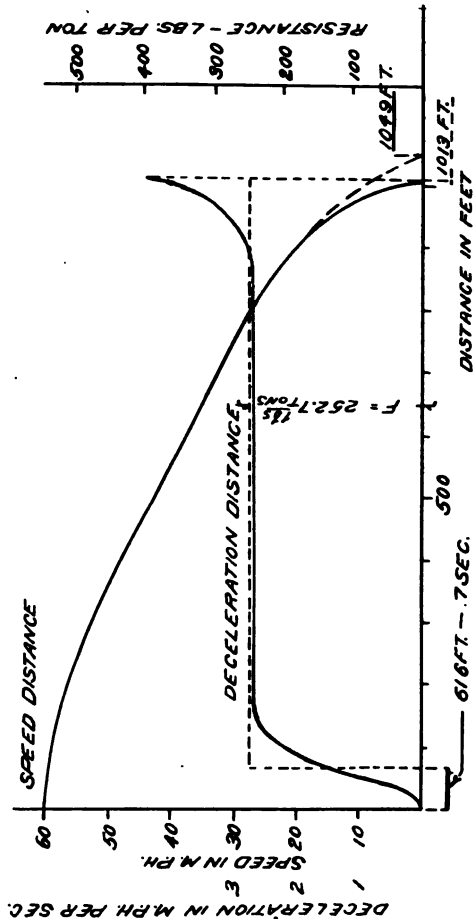


Fig. 19

Fig. 16 gives the brake cylinder indicator diagrams obtained by means of a twelve car rack test of the brake equipment and from these diagrams the curves given on Fig. 17 were developed. The latter curves consist of the composite or average brake cylinder diagram for the cars and the resulting braking power curve based on 1.5% braking power per pound of brake cylinder pressure.

The curves of Figs. 16 and 17 show the development of brake cylinder pressure and braking power with respect to time, the composite brake cylinder curve of Fig. 17 being used to compute the time from start of application to the point of equivalent instantaneous application, shown by the dotted line, this time being .7 seconds. The object of determining this time, which is characteristic of the particular brake equipment in question, is to find the proper point at which the brake can be considered as fully and instantaneously applied. The braking power curve of this figure shows that a braking power of 151.8% will be obtained on the cars and that this braking power can be considered as instantaneously and fully applied .7 seconds after the start of the brake application.

The data afforded by the 1909 Lake Shore Emergency Tests of similar cars and locomotives consisted of values of rigging efficiency or "e" multiplied by coefficient of friction or "f." An inspection of the breakaway stops made showed that the value of "e" $\times$ "f" for the locomotive was .105 and for cars .087.

The computation of the locomotive and 12-car train stop from 60 M. P. H., using the data of the rack test and the data described from the previous road tests, can be made as follows:

	S	= Length of stop in feet.
	S ₁	= Length of the first portion of the stop in which the brake can be considered as not applied.
S = S ₁ + S ₂	S ₂	= Length of the latter portion of the stop in which the brake can be considered as fully applied.
S ₁ = vt	v	= Speed in feet per second.
S ₁ = 88 $\times$.7 = 61.6 feet	t	= Time from start of application to point of equivalent instantaneous application. See Fig. 17.
$F_T S_2 = \frac{1}{2} M v^2 = \frac{W v^2}{2g F_T}$	F _T	= Total braking force of train.
	M	= Mass of train.
	W	= Weight of train.
or	g	= Acceleration of gravity = 32.2.
$S_2 = \frac{F_T}{W v^2} .0334$	V	= Speed in miles per hour.
$S_2 = \frac{(W_C + W_E) V^2 .0334}{F_C + F_E}$	W _C	= Weight of cars in pounds = 1,406,400 lbs. or 117,200 lbs. per car.
	W _E	= Weight of engine in pounds = 420,000 lbs.
	F _C	= P W _C e f = 1.518 $\times$ 1,406,400 $\times$.087 where P = per cent. braking power of cars or 151.8% (see Fig. 17) and e f = .087 for cars.
	F _E	= P W _E e f = 1.02 $\times$ 420,000 $\times$.105 where P = per cent. braking power of engine or 102%. (ET engine brake equipment, 85 lbs. emergency brake cylinder pressure and 1.2% braking power per pound brake cylinder pressure), and e $\times$ f = .105 for engine.

$$S_2 = (1,406,400 + 420,000)(60)^2(.0334) \\ (1.518 \times 1,406,400 \times .037) + (1.02 \times 420,000 \times .105).$$

$$S_2 = 951.8$$

$$S = S_1 + S_2 = 61.6 + 951.8 = 1013.4 \text{ feet.}$$

The result of the above calculation is shown in plotted form on Fig. 19 and is represented by the full line curves. The curves of Fig. 18 show the same stop plotted on a time base from a knowledge of the initial speed, total braking force of the train and the computed stopping distance in feet.

The calculations and all the curves except the dotted line curve on Fig. 19, were made on February 1, 1913 just previous to the P. R. R. Absecon Brake Tests, which were inaugurated on Feb. 10, 1913. On March 18, 1913, a test stop was made with a train consisting of a locomotive and 12 cars from a speed of 60 miles per hour. The conditions of this test were in every essential way comparable to the conditions assumed in the calculated stop.

The measured stopping distance of the road test was 1,049 feet or 36 feet longer than the calculated stop of 1,013 feet. This difference of 36 feet is only 2.9% of the actual stop distance realized. Fig. 19 is a graphic statement of these comparisons.

Brake Calculations.

As evidence of how thoroughly the various factors in brake performance are now understood, I shall take two runs made in recent tests and show that by using the conditions existing during these runs, that the calculated stops agree very closely with those actually made.

For the first case, a single car breakaway stop has been chosen. The observed speed at the time of brake application was 61.06 M. P. H., the actual braking power was 125% and the full cylinder pressure was attained in 2 seconds. Before we can proceed further, it is necessary to choose a value for the overall efficiency of the foundation brake gear and this has been taken as 10%. 61.06 M. P. H. in feet per second is 89.5. A braking power of 125% and an overall foundation brake gear efficiency of 10% produces a retardation of $32.2 \times .10 \times 1.25 = 4.02$ feet per sec., 100% retarding force equaling 32.2, that is to say, with such a retarding force the speed would be reduced at the rate of 32.2 feet per sec. This retardation, however, is not instantly secured since it is 2 seconds before full cylinder pressure is attained. But the effect is approximately the same as though half the retardation was secured from the time the brake was first applied until it was fully on. That is, the speed will be reduced by $(4.02 \div 2) \times 2 = 4.02$ feet. The speed when the brake is fully applied will therefore be $89.5 - 4 = 85.5$ feet per second. The distance covered while the brake is being applied is consequently $(89.5 + 85.5) \div 2 \times 2 = 175$ feet. To reduce the speed to zero from a speed of 85.5 feet per second with a retardation of 4 feet per sec. per sec. requires 21.4 seconds. The average speed during this time is $85.5 \div 2 = 42.75$, or the distance covered is $42.75 \times 21.4 = 915$ feet. The length of the stop is therefore $915 + 175 = 1,090$ feet. This is to be compared with an actual length of stop of 1,098 feet. That is, the length of stop as calculated was 1,090 feet and as measured 1,098. This is an error of less than 1%.

For the second case, I shall also take a single car breakaway stop but braked at 150% braking power instead of 125%. The actual speed in this case was 60.10 M. P. H., and the full cylinder pressure was attained in 2.2 seconds. Assuming again an overall foundation brake gear efficiency of 10% and following the same procedure as in the first

case, we calculate that the stop should be made in 895 feet. It was actually made in 886 feet. This is an error of 1%. In this case, the calculated stop is somewhat longer than the actual stop; in the first case, somewhat shorter.

It is not my intention to impress upon you that all calculated stops agree so closely with the actual stops, for they do not. But this does not come about because of any variation in the air apparatus but because of variation in the overall efficiency of the foundation brake gear. The average stop will agree almost exactly with the calculated stop, although isolated stops may not agree with the calculated stop within less than 15%.

In this connection it may be of interest and value to show how the length of stop may be readily and easily derived if the retarding force be known and then to show how the retarding force may itself be calculated. According to the law of the conservation of energy, the work done in stopping a train is equal to the kinetic energy contained in the moving train at the moment the stop is commenced. The work done in stopping a train is the retarding force multiplied by the distance through which it acts, that is, the length of stop. If F indicates the retarding force and S the length of stop, then FS equals the work done.

The kinetic energy at the commencement of the stop can be proven equal to one-half the mass, the mass being the weight divided by the acceleration due to gravity, times the square of the velocity, or if M represents the mass and V the velocity, then the kinetic energy equals $\frac{1}{2}MV^2$. Hence, if the retarding force be known, it is only necessary to divide the kinetic energy possessed by the train at the commencement of the stop by the retarding force, to find the length of stop.

To find the retarding force, it is necessary to proceed as follows: The car weight multiplied by the percentage braking power gives the total nominal shoe pressure. All of this total nominal shoe pressure is not realized as retarding force because of the losses in the foundation brake rigging and the frictional limitations of the brake shoe. But if the total nominal shoe pressure be multiplied by the overall efficiency of the foundation brake gear, then the result is the retarding force. That is, if P represents the braking power, W the weight of the train, e_1 the overall efficiency, and F the retarding force, $F = WP_{e_1}$.

To illustrate how these relationships are actually applied, suppose we wish to find the retarding force, and then the braking power, necessary to stop a car weighing 100,000 lbs. from a speed of 60 M. P. H. in 1,000 feet. Assume that two (2) seconds are required to apply the brake full, that is, the mean time is 1 second. Then before the retarding force commences to act, the car will have traveled a distance of 88 feet or the retarding force really acts through a distance of $1,000 - 88 = 912$ feet.

The kinetic energy possessed by the train will be one-half times the weight divided by 32.2 times 88 squared, or 12,000,000 foot lbs. The retarding force required will therefore be $12,000,000 \div 912 = 13,200$ lbs. If we take the overall efficiency of the foundation brake gear to be 10%, then the necessary braking power will be $13,200 \div (100,000 \div .10) = 132\%$.

It may happen that the converse of this case is given. That is, the average retarding force throughout the stop may be given as being 10% of the weight of the car and it is asked what the stopping distance will be from a speed of 60 M. P. H. If the car weight is 100,000 lbs., the kinetic energy will be 12,000,000 foot pounds as found above. The retarding force will be $100,000 \times .10 = 10,000$ lbs. The stopping distance will then be $12,000,000 \div 10,000 = 1,200$ feet.

Some may say this is theory or mathematics, and not practice, or will not work out in practice, but I controvert this by saying I have

shown that this is not so. Moreover, it is the analysis of a stop, subdividing it into its elements and thus discovering where the variables that caused such variation in stops exist, that has led, in many cases already, and will in many more in a short time, to improvements in these respects, with the result that the variable elements have been made more constant than heretofore, thus making it quite possible to install a brake whose actual performance agrees closely with what was expected from the calculated design.

Summary of Electric Control.

To sum up the requirements and considerations of the electro-pneumatic brake equipment, I present the following:

1. FUNDAMENTAL PRINCIPLES RELATIVE TO ELECTRIC CONTROL OF THE AUTOMATIC BRAKE.

1. The electric control system must not, either in its proper or improper action, or in its failure to act in any way, impair the stopping power of the automatic brake system.

2. During electric control of brake applications, loss of current must not cause loss of braking power already obtained.

3. The opening of the application magnet valves must invariably be accompanied by the closing of any possible outlet to the atmosphere.

4. The application and exhaust magnets of the electric brake must be cut off from connection with the atmosphere when the brake is applied automatically.

5. The design of the electric brake should be such that it purposely actuates the triple valve as with a pneumatic application, and a brake-pipe reduction must be made approximately equal to that required for an automatic application; that is to say, the operation of the electro-pneumatic brake must be as nearly as possible the equivalent in all particulars of the operation of the automatic brake.

6. The electro-pneumatic system is best which uses the same positions of the brake valve as the pneumatic and operates the brake in the same way.

7. The electro-pneumatic quick-action emergency is essential to the safety of modern trains and traffic; therefore, such a reserve of air must be preserved as will permit of an emergency application at any time.

2. BATTERY CURRENT.

Battery current is considered fundamentally desirable to the satisfactory operation of the electric control of brakes, because of its reliability, uniformity and availability. It is immaterial how the battery is charged, provided it is of ample capacity.

3. NO CURRENT AT BRAKE VALVE UNLESS ALL JUMPERS IN PLACE.

The wiring scheme should be such that the fact that current is obtainable at the brake valve indicates in itself that all the jumpers are properly in place throughout the entire train; an interrupted control current is, in a degree, analogous to a closed angle cock in the brake pipe.

4. PROTECTION OF BATTERIES.

In steam road service, with means of obtaining the current from the car lighting systems, a device must be provided to prevent inadvertently cutting the brake supply wires on to more than one source of electrical energy at the same time.

5. TRAIN SIGNAL.

Electric operation of the train signal should be considered a part of the electro-pneumatic brake system.

6. UNIVERSALITY OF EQUIPMENT.

Until recently, the entire development of the automatic air brake has been along the lines so admirably laid down at the beginning by Mr. George Westinghouse, and each new form of equipment has worked in harmony with its predecessors. Owing to the enormous investment involved and the wide interchange of equipment throughout the country, this procedure has been of incalculable value to the railroads and in the radical change in the method of control of the automatic brakes that we are considering it would seem to be equally necessary that this important principle be followed. It, therefore, is greatly to be desired that any new equipments be operative on their strictly pneumatic side with the present forms of automatic brake, during the necessarily very long transition period, and that the one or more systems of electric control that may have to be used must be interchangeable in their operation. This, however, should not be understood to exclude special installations such as now have (or may have) to be made with pneumatic brakes, where interchangeability is not to be considered because of the isolated and local conditions.

7. ELECTRO-PNEUMATIC BRAKE VERSUS AN ELECTRICALLY-CONTROLLED AUTOMATIC AIR BRAKE.

The ideal electro-pneumatic brake is one in which all functions are controlled electrically and the compressed air serves only as the medium of power transmission. Cars equipped with such a system would not be interchangeable with those having the present automatic brake, consequently the first essential would not be fulfilled, and to accomplish this the parts required to make an automatic air brake must be added. Again, in order that an electric system of control shall, in itself, be absolutely dependable, it is necessary that, as with the air control, loss of the controlling element shall set the brakes. Our experience with a purely electric system of control tested on the Boston Elevated Railway in 1909, demonstrated that there were many ways in which the controlling element could be lost without manifesting the location of the cause, which in the case of air is so readily determined from the noise made when escaping. Hence, such a system of electric control might necessitate the presence of an electrician on each train to promptly locate the cause of a loss of current or the installation of automatic indicators. As the air supply comes from the locomotives, a pipe to conduct the compressed air to the cars is necessary in steam train service. Such being the case, loss of air from the pipe or the brake system is with any design available to set the brake if the train breaks in two. At present, therefore, the practical electric control of the brakes must necessarily be built upon the automatic air brake as a foundation, and only such a system has been considered or advocated in this paper.

8. FUNDAMENTAL REQUIREMENTS OF A BRAKE.

Among the fundamental improvements to the present pneumatic brake before it is wise to install the electric features, unless it is only to offset conditions that prevent the pneumatic brake operating as it should, are that the emergency application be

First—More quickly obtained than has been the case.

Second—More powerful.

Third—Obtainable at any time.

The Westinghouse Air Brake Company and the engineers of some of the railroads have taken the stand (1) that it is fundamentally necessary that the difference in time between the attainment of full cylinder pressure in service and emergency application *should be the greatest attainable* (assuming that the rate of service application is as high as practicable); while (2) the difference in stops should be at least 100%.

9. RELATION OF ELECTRIC AND AUTOMATIC EMERGENCY APPLICATIONS.

Since there can be only three objects in adding electric control to the automatic air brake, namely,

First—Increased safety (emergency);

Second—Reduction in time required to make stops (service);

Third—Elimination of the time element inherent in pneumatic transmission of braking action, which in itself reduces shocks and stresses associated with purely pneumatic operation, and also reduces the judgment and skill required of the manipulator of the brake to a minimum;

it follows (1) that the automatic air brake must be equal to the electric in every feature of emergency application, except that of time; (2) that no logical reasoning can justify the application of electro-pneumatic brakes unless the preceding requirement is observed; (3) that an automatic air brake inferior to the electric is likely to be dangerous to a degree approximating the difference between the effectiveness of the electro-pneumatic brake and the automatic air brake, and, where great inferiority of the latter brake exists, the chances for disaster (when the electric control is inoperative when attempt is made to use it) are greater than if no electric control of the brake is employed, unless, of course, the same distances for signals, etc., be allowed as though the electric feature did not exist.

10. RATE OF EMERGENCY APPLICATION.

In emergency applications maximum braking power should be obtained in the shortest possible time consistent with practical construction; this applies to both rate of transmission and rise of cylinder pressure. In other words, it is not sound engineering to add the electric control to a pneumatic brake until everything practically possible has been obtained by proper design and installation of the pneumatic device.

(By sound engineering is meant the best for the purpose (by purpose is meant the shortest practicable stop); but it does not follow that some compromise may not be best for the conditions).

11. RETARDING FORCE.

The retarding force developed in emergency applications should be such that the stopping distance is at most not more than half that of the service stop. This does not necessarily mean that the shoe pressure or braking ratio should be twice as much in one case as in the other, for it depends on the type of brake used. All the factors taken collectively will determine this.

12. EXTENT OF ELECTRIC CONTROL.

Use of electric control can be made in three ways—and this manifestly whether the improved pneumatic brake is used or not:

First—To apply to both the service and emergency functions of the automatic brake.

Second—To the emergency functions only.

Third—To the service functions only.

In the first, the effect will be, as far as stopping distance is concerned, to leave the service and emergency brakes relatively the same as at present, and this applies, no matter whether the electric is applied to the old or improved forms of pneumatic brakes; the gain, however, will be two-fold. First, both the service and emergency stops will be shortened because of the elimination of the time element in getting the brake application started; and second, shocks will be eliminated because of the simultaneous application of the brake.

In this connection it should be understood that the application of the electric control to any form of pneumatic brake will insure freedom from shocks, but if safety is the chief desideratum, this can be had to a much greater degree and for less expense than is possible by the mere application of electric control.

If applied as per No. 2, the gain will be, first, somewhat greater safety due (a) to the simultaneous application of the brakes, (b) to the reduction of shocks, wheel sliding, etc., and (c) to the increase and effectiveness of the emergency brake over the service brake; second, the elimination of damaging and discomfiting shocks so far as emergency application is concerned.

If applied to the third, that is, to the service functions only, the gain will be in the saving of time to get the brakes applied, and in the elimination of shocks and discomfiting surges, so far as service applications are concerned. However, the application is undesirable from the fact that it reduces the margin between service and emergency stops; in fact, it is possible to so make the installation that the electrically controlled service stop would be shorter than if the stop was made with the strictly pneumatic emergency application.

Therefore, it will be seen that an electric pneumatic installation in which the service application of the brake approximates in efficiency that of the pneumatic emergency is strongly defective.

From these considerations we conclude, first, that the greatest gain in every way can be had by adding the electric control to the most improved form of pneumatic brake; second, that it should be applied to both the service and emergency functions of the brake; and, third, that it should not be applied to the service brake only, but may be applied with considerable gain to the emergency brake only; and fourth, that the application of electric control to the brake will contribute to safety, economy and comfort to a degree impossible of attainment with a strictly

pneumatic brake and to an extent far beyond any consideration of expense or complexity.

It is seldom that any one device or appliance offers the solution of so many problems, overcomes so many difficulties, and at the same time utilizes such a vast energy that now is dangerous or goes to waste.

This system eliminates time so far as brake initiation and propagation is concerned.

It eliminates retardation shocks, since it reduces brake operation as closely to the effects as though one vehicle only was being retarded.

It reduces the human equation to a very low factor, as it is so promptly responsive and flexible that correction of errors of judgment in manipulation can be made before inconvenience or damage can occur.

It is free from many of the shortcomings of other brake equipments, special care being taken to insure its immunity from influences (which unavoidably exist) that cause brake operations contrary to what are contemplated or when not desired.

It increases the safety of train operation, because full emergency braking force is available and obtainable always and instantaneously effective.

For "service" (station stops, etc.) operation, it is especially valuable from a revenue standpoint, as it permits of stops being made in much less time with a reliability, smoothness, and accuracy heretofore impossible.

It permits of accurate, instant and comprehensive communication between the engineer and train crew, or vice versa, thus contributing largely to co-operation and efficiency.

It combines in one brake or train control equipment the two elements (compressed air and electricity) that seem intended to complement each other for this purpose; and since the combination has proven in practice to be fully equal to its theory, it can hardly be called prophecy to say that its potentiality will be taken advantage of as it becomes known.

It is reliable, adaptable, and complete, and the writer has endeavored to so carefully and fully set forth the system as to permit those interested or concerned to verify all that is claimed for it. If this is accomplished, my purpose is served, and much progress in this important and difficult field will have been made.

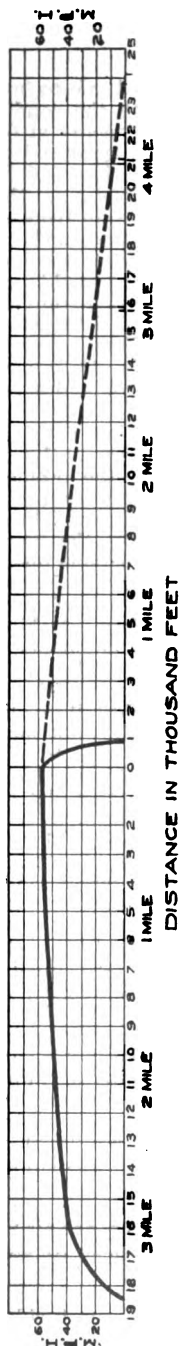
Conclusion.

No doubt some of you may conclude that, as presented the brake problem is a very intricate and complex one. In fact, you may even say that you expected me to simplify the problem as it already existed in your minds, instead of which it is more of a problem than ever. I ask you to remember that I am not responsible in any manner for the problem. Nature is responsible for the existing forces, or rather nature prefers to remain in a state of equilibrium, but when men in the form or shape of the railroads undertake to disturb this equilibrium by starting great weights in motion, it is imperative that these same men adopt means for controlling or dissipating the energy thus developed, otherwise that which they are endeavoring to accomplish can at the best only be attended with many calamities. Again, unless means are provided for controlling this energy or bringing the mass back to a state of equilibrium again, the capacity of the railroad, both in mileage and equipment, will be very much curtailed, since, if a speed of 60 miles per hour were permitted, trains could not be run closer than 5 miles apart, as shown by Fig. 20, and the average speed could not be more than 30 miles per hour where stopping places were not more than 8 miles apart. In

CLASS E-2-D LOCOMOTIVE.

TOTAL WEIGHT OF TRAIN 589.6 TONS.
 ACCELERATION DISTANCE OF 18500 FEET
 TIME OF ACCELERATION 5 MIN. 47 SEC.
 DECELERATION DISTANCE OF 984 FEET.
 TIME OF DECELERATION 18.7 SEC.

TOTAL ENERGY STORED IN TRAIN AND OVERCOME BY BRAKE 63260 FOOT TONS



BROKEN LINE REPRESENTS STOP WITHOUT THE USE OF BRAKES.

NOTE:- THE CALCULATED STOP WITHOUT BRAKES WAS OBTAINED BY
 ASSUMING 9.6 POUNDS PER TON RETARDATION DUE TO WIND RESIS-
 TANCE AND JOURNAL FRICTION. TRACK LEVEL

W. A. B. CO'S. EMERGENCY HIGH SPEED BRAKE TESTS.
 ABSECON, N. J. W. J. & S. R. R. MARCH, 1907
 CURVE OF ACCELERATION AND DECELERATION
 TRAIN OF ONE ENGINE AND TEN CARS. TEST No. 54.

Fig. 20

other words, it would not be considered safe to have more than one train for every 8 miles. Contrast this with the condition where a first-class brake is employed, that is, where the energy at 60 M. P. H. can be dissipated in 1,000 feet. Here the average speed could be 48 M. P. H., an increase of over 50%, and considering the distance over which the train would be retarding in the previous case, the average speed would be over 59¼ M. P. H., as against 30—an increase of practically 100%, and as far as the number of trains is concerned, trains could be run 1,000 feet apart with the same degree of safety as 5 miles apart in the first case, while three times as many trains could be on the same piece of track in an equal time with even a larger margin of safety, and, of course, what is said here, which may be applied to passenger trains, is equally true with regard to freight trains. That is to say, means must be provided for controlling them or dissipating their energy at will if safe operation is to be assured on the one hand, and a reasonable and commercial capacity of the road developed on the other.

This shows then that the brake has nothing whatever to do with the creation of the problem, and, consequently, can have nothing to do with its intricacies and complexities—the problem is as it is, and has been created by the endeavor of progressive and exceptional men to get the most out of nature's forces and possibilities for the welfare and progress of man. This being the case, the man who either thinks or endeavors to set up the problem as a simple one, is not the man who is rendering the desired, in fact necessary, assistance, to those who have created the necessity for a brake. A man who comprehends that it is a complex and real problem and therefore sets himself up to understand the principles underlying it and the requirements, is the man from whom the most may be expected, and he will render as much service to the railroad as does the man whose ingenuity and labor has created the necessity for a brake. To this end, he should fully realize that the brake must be considered as a whole, and here I do not mean merely as the complete equipment on a car from brake pipe to wheels inclusive, but the brake as a whole counting from the locomotive to the last car in the train, as it is the whole combination that determines what the action and operation of the brake shall be. If there is one factor in the brake that is relatively fixed, it is the air operated mechanism itself—all the rest that goes to make it up is extremely variable, even at best, but when not considered as a part of the whole, and therefore not kept as closely constant as may be, the resultant operation may be and often is far from what is desired.

No doubt it will sooner or later be appreciated that the problem of controlling trains, taken in its entirety, involving a consideration of the rail adhesion, all the various truck and car designs, weights of cars empty and loaded, speeds and frequency of trains, service and emergency operations of the brake, the elements of both the automatic and human equation which enter into brake performance, as well as all other factors involved, in smoothly controlling a train on the one hand and quickly stopping it on the other, is one of considerable magnitude, taxing both the ability and ingenuity of a thoroughly informed, specialized mechanical engineer, and from this no doubt the Superintendent of Motive Power will be provided with an assistant whose duties it shall be to secure such a harmony of design and equipment and such assurance for manipulation and operation as this paper points out, as must be the case, if full and profitable results of the air brake are to be obtained.

"If I have succeeded in making clear to you the great advantage accruing from actuating the pneumatic brake electrically; if I have impressed you a little more deeply than perhaps some of you have heretofore realized, that there are many things beside the operating devices

themselves that play an important part in the operation of the brake; if I have made it clear that co-operation, that is, team work, by all concerned to the end that all parts and conditions affecting the operation of the brake should receive due care and consideration; and that the returns make it worth while, I shall feel that my efforts to serve you have not been in vain.

The PRESIDENT—Gentlemen, Mr. Turner has stated that he finished the preparation of this paper a few minutes before he came into the hall. On this account we have not been able to, as usual, send advance copies of the paper to our members so that written discussions could be prepared, but we have the assurance of Mr. Turner that the paper in its entirety will be handed over to the Secretary and published in the Club Proceedings for future reference and study. In view of this it is advisable to present the subject immediately to the Club for general discussion, and that there may be no delay in opening the discussion on account of the lateness of the hour, I will call upon Mr. Langan, Chief Air Brake Inspector of the Lackawanna.

MR. LANGAN—The paper just read by our friend Mr. Turner is very comprehensive; so much so that I would rather wait and digest some of it before discussing it in any detail. I might mention this, however. Mr. Turner says he has a number of friends who require a whole lot of time to be convinced that he is right. I guess I might be classified as one of those friends. He also helps the engineer out, I notice, every time he reads a paper, and he makes the average air brake man work hard to convince him that it is not so. However, we have conditions where it is strictly up to the man. We must put it up to the human equation, no matter what we do. The fact of the matter is that in handling passenger trains some men become indifferent; and even though we have a mixed train, the man who uses proper judgment can handle it without shocks, whereas, on the other hand, if he does not use proper judgment he can give you all kinds of shocks in that train. That is a fact; because if you call his attention to the fact that he is handling the train roughly, from that time on he will make a dozen or two dozen stops without any further shocks. So, regardless of the equipment—I will eliminate the electric attachment now—but with our present old-time p. m. equipment, it can be handled without shocks if the man operating will use proper judgment.

I must qualify that. If I do not, Mr. Turner will come back at me. In the first place, in making a water stop poor judgment is used and trouble comes many times from the fact that the engineer will run in too closely and then expect to make a release and a reapplication in service when it is practically impossible to do so. In that case the head brakes are released, the rear brakes remain applied and the result is a shock. You may have uniformity throughout your whole train and your brakes and foundation gear may be in perfect condition, still you cannot avoid a shock. ¶ Another time when you get shocks is at slow-down points.

The engineer will slow down to the proper speed, release and use steam before the brakes are properly released, and the slack has had time to adjust itself; there is another shock, with proper equipment.

Starting trains certainly has nothing to do so far as the air brake is concerned. I do believe, however, that we can arrive at a basic instruction for the engineer to follow: that is, that the initial reduction must not be less than a certain amount. Mr. Turner places that at not less than 8 lbs. I should not want to have a man on a 10 or 12 car train make an 8 lb. reduction and not make a further reduction before he attempted to release. This brings us back to the stuck-brake problem. While there are a number of conditions and a number of statements he makes here, I should not want to get into an argument with Mr. Turner until I had read his paper very thoroughly, and that I will do after we get the proceedings. I thank you, gentlemen.

Mr. MACBAIN—Mr. President, I have listened with a great deal of pleasure to what I believe is the best air-brake paper that has ever been read before any body of men in the United States or any other country. Mr. Turner's analysis of the foundation brake matter is just as true as gospel. Everything that he has said to-night cannot be questioned seriously by any person who has given the matter any study along the lines on which it ought to be studied.

The proportion of reservoirs to brake cylinder touched upon by Mr. Turner is perhaps one of the greatest reasons, aside from poor judgment on the part of the man operating the brake, for rough handling of trains that we have had, and a great many of the roads not a thousand miles from Buffalo, in checking the matter up, found that they had many auxiliary reservoirs very much out of proportion to what they should be. Respecting the matter of instruction Mr. Turner touched on a point that rather than have a port-and-passage instruction for the engineer the instruction ought to be something that would educate the man along the lines of the general principle of the brake and then next to that the man ought to be educated along the lines of using the necessary judgment to manipulate the brake, even under bad conditions. There was never anything truer said. I have harped for several years on the method of instructing men in the use of air brakes, and have on many occasions given voice to the same sentiments expressed by Mr. Turner; that is, on the advisability of an instruction as to principle and operation rather than as to port and passage. What consequence is it to an engineer to know what this or that port in the apparatus amounts to unless he first understands the principles upon which the thing is made and upon which it operates? That is the first and most necessary item of the whole business,—to understand the principle of the apparatus and its handling.

The next thing after that is to have the man instructed so that he may exercise the proper judgment in the manipulation of the brake. As, for instance: a few years ago, with the incoming of the high-speed brake, the old-time instruction of making a light application and then increasing it till you

have enough on to make your stop was changed and the instructions were to the effect that when a man shut off for a station the first application of the brake must be not less than 10 or 15 pounds, and preferably at 20 if he was running at high speed. With the incoming the various classes of brakes covering the improvement that has been made along that line for the past six or seven years, trains of necessity had to be made up of units having brakes of different design, and, owing to difference in the time required for full application, smooth handling of trains was more difficult than before these improvements were initiated, and hence a modification of the instructions governing the use of the high-speed brake had to be made in order that trains might be handled with the least amount of roughness possible. Under the heavy reduction plan, with one of these mixed trains, due to the non-uniformity of equipment throughout the train, rough handling of passenger trains became very prevalent; and in order to reduce the effect of such non-uniformity of brake equipment to the minimum, it was necessary that the engineer in handling it receive new instructions to the end that he might minimize the shocks incidental thereto, by a proper manipulation of the brake valve. Men were instructed to, instead of making a 20-pound reduction, make say an 8-or 10-pound reduction, following which there would be some little shock throughout the train, but the effect of same was not disturbing; then to follow up such reduction with as many additional reductions as were necessary to bring about the results desired. This proved to be a very satisfactory arrangement, and the trouble experienced through the non-uniformity of brake equipment disappeared very rapidly. The result, it was found, was that an engineer on a train running at high speed who understands his business can apply the brake with 8 pounds, as Mr. Turner suggested, and instead of the train getting a terrific bump on the rear end as was the case when the brake was applied with a 20-pound application, the bump that would follow be insignificant. Then, of course, immediately on feeling his train settle down, which any engineer who has ever run a passenger engine ought to feel on his locomotive, he can follow up his application and get the desired pressure in the cylinders and handle a train very successfully, notwithstanding the fact that his equipment may not be uniform in class or adjustment.

Two years ago, after the winter of 1911, which was an exceedingly bad one on all the railroads, in the matter of slid wheels and other things incidental to very, very hard weather, one of the railroads—the road that I am connected with—selected from the ranks two of its most proficient air-brake operators, men who never had any trouble, never pulled out any drawbars, handled their trains successfully, were never complained of for rough handling or anything of that kind, and after a half hour's talk in the office of the superintendent of motive power they were sent out to give instructions to the men on the locomotives as to how to handle the brake valve and how to exercise judgment. The effect of that, I am going to say to you now, was better than any 15 years of port-and-passage instruction that we ever had on that road. Now we must admit we have these various classes of equipment and will have them a good while yet, and while it is true that we have the

human equation to deal with in this matter as in all others, it is possible for an engineer to handle a train of badly mixed brake equipment and handle it comparatively smooth, so much so as to avoid criticism on the part of the patrons of the road or damage to the equipment.

The instruction given to the engineer along the line of exercising the judgment that he should exercise, in the amount of initial application he should make and the distance from the station that he should begin braking is one of the most important things before us at this time and a great deal can be accomplished by proper instruction, and I just want to say that the responsibility in that particular part of the work must lie with the engineer. It is not asking too much of him. It is asking him to do only what he should do. He must put his very best thought into the matter, and if he does not know how to handle these things there is always someone who can tell him.

In conclusion I should wish to say, Mr. President, as I said before, that I believe this is the best air-brake paper that ever was read in the United States—and I have read all of them. I began way back at the time when we were operating passenger trains in the United States with straight air and followed the thing through to the present time, and I want to say that Mr. Turner's paper is the best and most lucid thing that was ever delivered to the railroad public. I thank you. (Applause.)

The PRESIDENT—We should be pleased to hear from Mr. Owens, of the New York Air Brake Company.

Mr. OWENS—I am very sorry to say that I am not in very good condition to talk to-night. Therefore I will not burden you very long with what I have to say. Possibly some of my friends will be somewhat disappointed as I think some of them have expected to hear a long talk, but the ground is so well covered in the paper there is not much opportunity to say more. But I tell my engineer friends to give the companies more in return for the awards given them of late, and believe that we can get more out of the equipment by better operation as well as better maintenance.

For illustration: it seems too bad that we have to suffer delays on important trains on account of a little vent port stopping up in a governor, therefore stopping the pump and having to call for another engine, when a little pin or something of that sort, would clean out the port and the whole trouble would be eliminated. In fact, I know of a case where an engine was sent light 100 miles thinking they had pump failure and it was nothing but a little governor failure that could have been fixed at the point from which the engine started; and I regret to say that the traveling engineer ordered the engine in. We can hardly afford to have conditions of this kind exist when a little information would eliminate the trouble. I also know of another case where a circus train came near getting away on account of the pump slowing down or stopping, for the reason just explained. After the train happened to get stopped they began hammering the pump with coal picks and one thing and another but it did not start and your humble servant

started it by simply picking out the little vent port. And so there are a hundred and one cases of this kind that can be very easily corrected, avoiding trouble and delay.

In regard to handling passenger trains from an engineer's standpoint. Sometimes he is censured wrongfully, but he should be able to handle the condition as it exists; or, in other words, he should take into consideration the differential braking force in the different trains. Some roads a few years ago issued instructions to apply brakes by making heavy initial reductions at the last possible moment when going into a station, which was all very good; but it was a very expensive way to stop the train, both in coal consumption as well as brake-shoe wear, etc., and discomfort to passengers where differential conditions existed. Those instructions were changed to making reductions light enough to absorb the shock. This is being done on a great many roads—in fact all over the country, with possibly a few exceptions—and I do not see but what they are making their time just as well, and I believe they are wearing out fewer brake shoes as well as using less fuel.

I wish to lay particular stress on a point in Mr. Turner's paper and that is the question of equal braking force, which I have talked on several times. It may be a little dry to some of you. Years ago we had cars braked at low percentages, also bad designs or, in some cases, no brake at all; but a few years ago the 10-inch equipment came in with the later triple valves, which was effective and did business; in other words, gave us 100 per cent. service. Of course when we mixed those cars in with those of the older type, we had trouble; and I am sorry to say that some of the officials criticized the new equipment instead of the old. But the point I wish to bring out is the question of the adoption of equal braking power. We have a variation in this country to-day of from 5 to 15 per cent. or over. It does seem to me we could have a uniform standard which would eliminate a great deal of this unequal condition we are continually discussing at every air-brake meeting. I believe it could be done through either the Master Car Builders Association or the American Railway Association. A few years ago this high braking-power proposition was started by some of our mechanical friends. It looked very good at the time, but it has made rather bad conditions for some of our engineers to meet. We sometimes criticize the engineer for rough handling when he hasn't anything to do with it at all. We criticize him for stopping the train with a straight air-brake; sometimes he does it and heats up tires, loosens them and causes trouble; but there are a great many instances possibly where we should not censure the engineer so much because he is afraid to apply the automatic brake as he does not know what is going to happen. That is the reason he operates the straight brake. Possibly he may have a pump on the engine with about half the capacity it should have, and the result is, if he applies the automatic brake, a delay of several minutes is caused—possibly half an hour, in getting his pressure restored without regard to the bad results he might get by handling the train with the automatic, if unequal braking force existed. If we give the engineer the tools to work with in the majority of cases

it will be found that he will give very good results. I am a great believer in starting in at the root of the real trouble—the equal braking power proposition as well as good condition of equipment, and then we can go to the engineer for good results.

I was at a convention or meeting sometime ago where one man seemed to monopolize all the time in talking on this and that, pro and con. Several specialists on the particular subject were present and it was regrettable that they did not have an opportunity to talk in order that those present might get the benefit of their views. Consequently, I will not be that man here to-night and will give way to a number of friends who have come here from distant points to express themselves on this subject and of which we will get the benefit. Mr. Turner is entitled to a great deal of credit for this paper. Thank you. (Applause.)

The PRESIDENT—Are there any other gentlemen who desire to talk on this very interesting paper? If not, I will call upon Mr. W. H. Sitterly, of the Pennsylvania Railroad. I understand the Pennsylvania Railroad is the only road that has in operation the electro-pneumatic brake and I believe Mr. Sitterly can give us some information that will be acceptably received.

Mr. SITTERLY—I have listened with interest to Mr. Turner's paper to-night and I have had the pleasure several times previously of listening to Mr. Turner when he talked on air-brake subjects. It is true that the Pennsylvania Railroad did make a number of tests, extending over a period of three or four months, with the electro-pneumatic brake, on the West Jersey & Seashore Railroad, between Absecon and Egg Harbor. What Mr. Turner has said for the electro-pneumatic brake to-night was borne out at the tests with a 12-car steel train at that point. Since those tests the Pennsylvania has equipped a number of cars with this equipment, less the electric feature. During the transition period that feature will be left off the equipment. The balance of the equipment has been installed on the cars and works in harmony with the rest of the brake or the old p. m. brake on other cars. The fine points of this brake undoubtedly will be brought out by Mr. Turner in the paper and at this late hour I am sure I will be encroaching on your generosity to dwell on it. If any of the railroad men from the other roads, in the city or out of the city, happen to be in Buffalo and will call at our Buffalo shops, they will find what our air-brake instructions are and Mr. Ransbury will be only too pleased to go into the details of this brake for your benefit.

MR. PRESIDENT—Do any other gentlemen desire to talk on this subject? If not, Mr. Turner, have you a few remarks to make?

MR. TURNER—I hardly know how to express myself in appreciation of the treatment accorded me this evening. That is saying something for myself, but it is not all I want to say, for I desire to compliment the Club as

a whole. I attend a great many club meetings at different places, but this beats anything I have yet experienced. I think, from the number of men here—no doubt a lot of them having far to go, and the fact that they have stayed here as long as they have, and taken the interest they have taken, demonstrates that there can be no doubt that you should and will have such flattering reports as Mr. Vought, your Secretary, read to you this evening, and it is a pleasure, more than that, it is the duty of a man who has the opportunity to acquire information, to come before you. I want to thank you with all my heart for the kindness and appreciation that you have shown to-night. I have gotten that much out of my system, but that is not half of what I feel. Beyond this, it encourages me with a strong hope that the brake as a whole, will yet receive the consideration it merits.

I want to say, with regard to Mr. Langan, however, that he and I usually agree and disagree, that is to say, he will pretend to disagree with me until I have made clear to him the extent of my proposition and meaning. I did not say anything to-night, particularly, in exoneration of the engineer, nor had I it in mind. That is a subject in itself. To-night I am speaking chiefly of designs, and not of manipulation, though I have distinctly pointed out that a proper understanding and manipulation by the engineer, are vitally important, if freedom from inconvenience and troubles is to be secured. I have mentioned emphatically, not only in this paper, but in many others, the part the engineer and other human agents play in the operation and performance of the brake, but I am dealing principally, to-night, with the brake problem as a design, and with its makeup, as it is when all its different valves and parts are combined in a train in what is really one brake, that is to say, when we combine brakes of various degrees of perfection on cars of different lading, and with brake gears of many designs and different degrees of efficiency, that we are not likely to have a harmonious whole, and the operation, even with extreme care on the part of the engineer, will vary as the square of the variation of the different parts comprising the whole, and this inversely, to what is desired. Still, I am glad Mr. Langan has come here to say I need not think of these things, that all that has to be done is to get after the engineer, that as soon as you tell him he is kicking up a rumpus by handling the train roughly, and get after him with a sharp stick, lo and behold, everything becomes all right. If this is so, then certainly there is not anything wrong with the equipment, any part of it. This lets the equipment out and puts it on the engineer.

My friend Mr. Owens gets up and takes the opposite tack, and says the equipment is all shot to pieces and we must get after that, and then the engineer has a show. As a matter of fact, gentlemen, to come right down to it, both have to be considered, and what Mr. MacBain says is undoubtedly right, and I am exceptionally well pleased with the broad and comprehensive view he has taken of the matter. There is no question but that the engineer is a large factor in producing proper results in brake operation, and particularly under the present condition, of all that goes to make up a train brake. The human equation is probably the greatest factor in the railroad business, if we get right down to it, and I know the engineer can

do far better than he does, even with the equipment as it is, and I also know that the engineer must do far better than he now does or can, if the equipment be put in the condition it ought to be, and if we consider it as a whole. Let us get after those details that have been neglected so long. The cost will be far less to have them right than to have them wrong, but aside from this, greater efficiency and freedom from troubles are greatly to be desired.

Both Mr. Langan and Mr. MacBain properly realize the importance of operating the brakes as they should be, which often means differently one time from another. For instance, due to the protracted and very long period of cold weather two years ago, there was much wheel sliding over all the cold area, and on the New York Central lines, perhaps more than elsewhere, as equipments were mixed, water vents from the cars directly over the rail, very heavy car equipment, some of which had brake gear full of potential for trouble, and last but not least, the method of operation was, as Mr. MacBain says, to make heavy initial reductions of no less than 15 pounds. The weather was there, the other evils could not be cured at once, but the method of operation could be changed to lighter reductions and a short time holding on of the brake, so that if wheels did pick up, they would not be flattened. This was done, and men delegated to instruct and see that it was done, and most of the trouble ceased. From this, as never before, all concerned became convinced that manipulation of the brake by the engineer must vary with conditions on the one hand, and that instructions must be devoted chiefly to outlining the different conditions and the manipulation best suited to them on the other. This, however, is only one phase of the whole brake question, and what I have said should satisfy Mr. Langan that the engineer has an important place in its performance. Another phase is what I have been chiefly discussing to-night, but I assure you I am anxious to give due consideration to all.

Uniform braking power, which Mr. Owens speaks of, is a great help. That is one of the things I was trying to illustrate, but there is very little variation in the nominal percentage employed in brake designs for passenger cars, but there is an exceedingly great variation in the braking power of retarding force realized, for this realization is contingent upon many things. The difference in the mechanical efficiency of the brake rigging is one. Others come from where the auxiliary is not of proper volume, from the piston travel not being adjusted or maintained as it should be, from the truck design and foundation brake gear being such that the piston travel cannot be made or held at what it ought to be. Of course, when these things exist, the engineer is going to have a troublesome time, but a proper understanding by him is going to help out, if we go after these things. As far as Mr. Langan is concerned, I agree with him that the engineer is a factor in it. At the same time, I am not going to the other extreme and say that everything else is as it ought to be, and so get after the engineer, expecting that everything will then be all right. This can only be so on the assumption that the engineer is a cure-all, which investigation will show, is not possible. A cure can only come from starting at the source of the trouble and making right that which is not right now. I am not pleading for the exoneration of any one, but for

an increased efficiency, increase in the capacity of the railroads, for greater safety, for getting more out of the equipment than we now get, and for co-operation to this end. When a train is traveling through space at 60 M. P. H., that is, 88 feet a second, it has a whole lot of energy in it and the quicker it is gotten out when necessary to stop, the better. Not only is it safer, but it is profitable. We are running twice as many trains in the subway of New York to-day as we could before we equipped them with the present very efficient brake. I was told recently that if the improvements in brake equipments were now taken off and the train re-equipped with the old brake, it would tie up New York City, for there would be over 500,000 people per day for whom there would be no means of transportation. We have a certain potential for economy of train operation in the rail. Let us use it up. Get it out of it and increase the capacity of the railroads, or where this is not at present so important, do the same work with less equipment. As I have shown you, without a brake, you could run one train only every eight miles, while with a good brake on, you can have one every 1,000 feet if you want. That shows what you can do as to capacity and to this end, as well as for the elimination of delays and troubles, I am asking not only for the right kind of instruction of the engineer, but for proper and harmonious designs, so that we may utilize more fully and efficiently the possibilities in the natural forces which have already done so much for the development of this country. To fail to utilize these in the brake is as bad or worse—in fact, it is worse—than to fail to use them as a means of acceleration.

I want to thank you once more for the reception of my efforts of to-night, and I sincerely hope that our meeting together will help us to look at things from the same standpoints, or at least meet on a common ground, so that co-operation, or team-work, will result to produce that which we all so much desire. I thank you.

MR. MANCHESTER—Mr. President, I can only indorse what Mr. MacBain has said in regard to the paper. I have but about 10 minutes to catch a train and I ask now the privilege of moving that a rising vote of thanks be tendered to Mr. Turner for his very valuable, instructive and interesting paper. (Seconded.)

THE PRESIDENT—Gentlemen, you have heard the motion made by Mr. Manchester and duly seconded. All those in favor of the motion will please stand. (All rose.) Mr. Turner, you have the unanimous vote of the members of the Central Railway Club for your very valuable paper and I hope that you will carry with you to your associates the good will and esteem of the Club.

The next order of business will be the report of the committee on the award of premiums in the contest in new membership.

Depew, N. Y., January 2, 1914.

Mr. Harry D. Vought,

Secretary-Treasurer, Central Railway Club, New York, N. Y.

Dear Sir.—The committee appointed by our president, Mr. W. F. Jones, to make award of the first and second premiums offered for members filing the greatest number of applications for membership during the year ending November 1st, 1913, beg to submit the following report:

Total number of applications submitted.....	112
Member filing the greatest number of applications, Mr. T. F. Toughey.....	32
Member filing the second greatest number, Mr. W. H. Sitterly....	13
Member filing the third greatest number, Mr. J. S. Ryan.....	7
Members filing the fourth and fifth greatest number, Messrs. W. F. Jones and H. C. Edson, each.....	6

We, therefore, make our award for the first premium to Mr. T. F. Toughey, and the second premium to Mr. W. H. Sitterly.

Yours truly,

J. C. PARSONS, Chairman
H. C. EDSON
WM. OWENS.

The SECRETARY—This is the first time in the history of the Central Railway Club that a contest of this kind has taken place. In the past 25 or more years it has been my privilege to perform many duties in behalf of the Central Railway Club. None has ever equaled in satisfaction, in gratification and in unalloyed pleasure that which is now about to be performed in presenting to these two gentlemen these premiums earned, and who stand before you as striking examples of what every member of this Club ought to have done. If they had we would have our thousand members.

I think it is well understood, certainly by those who have grown gray with me in this organization, that a favorite argument of mine—morning, noon and night and sometimes very late at night—has been that only individual effort can build up an organization as this has been built up. It is only by individual effort that the men to whom you give the management of the affairs of the Club, can be sustained and are able to carry out plans formulated when they take office. It is individual effort alone that makes certain the strength, numerically, the strength financially, of any organization.

I ask you to accept these few words of admonition simply that it may possibly stimulate you now to resolve that before another annual meeting of this organization arrives, the Central Railway Club shall be able to boast of nearly one-half the number which the mother club of this organization has as members. The New York Railroad Club to-day is very proud of its membership of more than 2,000. Its oldest child, The Central Railway Club, with such an aggregation as we have here to-night, should, with the properly directed effort of each member, one year from now, point with equal pride and pleasure to the fact that it has 1,000 members. May I repeat what has

been said to you upon a former occasion, that I hope my life may be spared so that I may enter with you into the enjoyment of such a triumph.

My only regret at this time—and you know the bitter always goes with the sweet—is, that you let Little Tom (referring to Mr. Toughy) get away with this first premium. You ought to have given him a hotter race than you did. But he has done well. Mr. Toughy, you deserve the reward that comes to you for what you have accomplished. I hope it will stimulate you to go on and do the same this year so that you may contribute your quota to the fulfillment of that purpose that we have in view—one year from now, 1,000 members. It is with great satisfaction that I hand you the first premium, fifteen dollars in gold. (Mr. Toughy accepts the token.)

Mr. Sitterly, you are the younger one; you are still a boy compared with Mr. Toughy and others; but you have shown your good will; you have shown what a man can do; and you will please accept this second premium of ten dollars (handing Mr. Sitterly the premium.) May it stimulate you to go on and do things which are still greater than you have so far achieved.

MR. TOUGHEY—Mr. President, Mr. Secretary and gentlemen, to be the recipient of the capital prize in a contest of this kind is of course something to be proud of for more reasons than one. The lateness of the hour favors me with the fact of my inability to make any extended remarks, especially on account of my extreme modesty. I first wish to reiterate every word your secretary has said. As a member of the entertainment committee I was primarily responsible, I think, for taking the Club on our September, 1912, outing to Dunkirk, in the hope of interesting a number of our friends connected with the American Locomotive Company to take membership in the Club. Although I knew of this prize having been offered, I did not give the matter a thought when I visited Dunkirk one day and in a couple of hours secured 11 applications for membership. Later I secured others. It was when I brought in a bunch at the last outing that the secretary said to me, "I think you are after the capital prize."

It simply shows, gentlemen, that the individual effort of every member of this Club is all that is necessary for the Club to succeed as it should and as it has in the past. I am sure that the interesting paper you have all heard this evening has been very instructive to every one. I am also sure that every one of you has several friends who are eligible to membership in this Club to whom this paper and other papers that have been and future papers that will be presented before this Club will be of great interest. There is therefore no reason why they should not, and every reason why they should, become members of the Central Railway Club and participate in its most excellent work. If you will always keep in mind when you meet a friend the fact that this Club is a part of our railroad life, and do not let him get away from you without asking whether or not he is a member of the Club, our membership will be greatly increased. If you do not happen to have an application blank in your pocket you can take his address and ask the secretary to send him one, as I have done in some cases. I have recommended

applicants whose business is within two blocks of the secretary's office in New York, who have been admitted to membership.

There is one thing that is particularly gratifying to me on this occasion. My friend Sitterly lives practically across the street from me and the two prizes are going to the same block in the city of Buffalo. There is another thing that is also very gratifying to me: the first thing I will be able to do when I get home to-night will be to hand this golden prize to my good wife, who has been confined to her room for the past three months on account of illness. I thank you, gentlemen. (Applause.)

MR. SITTERLY—I am not as modest as my friend Mr. Toughy, Mr. President, but I am not going to talk as long as he did. I assure you that I am surprised at receiving this token. Nevertheless, I am pleased. The only thing that makes me sore is that I let a switching road beat me out. (Laughter.) I am not going to take this home and give it to my wife because I haven't done anything that I need to square myself for just at the present time. (Laughter.) I hope, Mr. Secretary, that your wish will be realized; that everybody will endeavor to bring in an applicant, and I assure you I will do what I can. (Applause.)

The PRESIDENT—The Secretary just informs me, gentlemen, that 27 applicants have been elected to membership in this Club at this the first meeting of the new year. Their names and addresses will appear in the published Proceedings. It is very gratifying to know that there is an interest in this Club that cannot be downed. We hope to increase the membership and bring it up to the mark set by our secretary.

The next in order will be the report of the tellers on the election of officers for the year 1914. The secretary will please read the report.

Buffalo, January 8, 1914.

To the Officers and Members of the Central Railway Club:

The undersigned tellers appointed by the President to canvass the ballots cast for officers for 1914, beg leave to report that the ballots were received at noon to-day as required by the Constitution and By-Laws, the total number of votes cast being 707, of which 14 were rejected for failure to comply with the Constitution and By-Laws. The 193 votes accepted gave the following result:

For President, W. Elmer.....	193
For Vice-President, H. C. Manchester.....	193
For Second Vice-President, E. J. Devans.....	193
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For Executive Members:	
W. F. Jones.....	193
E. M. Tewkesbury.....	193
W. F. Richards.....	193

Respectfully submitted,

W. H. SITTERLY,
J. H. CURRIL, Tellers.

The SECRETARY—I think it ought to be stated, Mr. President, that several members lost their vote, their votes being declared void because they had not paid their dues for the past year. Several failed also to carry out the instruction to sign their name in ink on the back of the ballot envelope. I mention this, Mr. President, for the benefit of the members in the future, so that they will be careful, because if they do not it voids their ballots.

The PRESIDENT—Gentlemen, you have heard the report of the committee appointed as tellers of the election of officers of the Club.

I therefore declare the gentlemen elected officers for the ensuing year and will appoint a committee, consisting of Michael Hassett, Frederick Green and F. Haley to escort the president-elect to the chair. Mr. Green not being present, will Mr. Owens act on the committee? (The committee then escorted President Elmer to the chair.)

The RETIRING PRESIDENT—Gentlemen of the Central Railway Club, in laying down the duties of your Club, as your presiding officer it is proper and I feel it is due that I express to you my hearty appreciation of the support given me during my administration. It has been a pleasure to work for the interests of this Club. It has also been a duty because I have been honored. A year ago when I took the chair as president I told you that I considered it an honor to be president of this Club. To-night I am doubly honored by being succeeded by the president-elect, Mr. Elmer. Will you all rise and greet him as our new president for the year 1914? (The members then rose and the retiring president handed the gavel to Mr. Elmer.)

PRESIDENT-ELECT ELMER—Mr. President and fellow members of the Central Railway Club, you may well believe what Mr. Jones has said to you, that it was an honor when he was elected to the presidency of this organization. I know that someone will have to succeed me next year and I know that my successor will feel as I feel to-day, following the successful administration which President Jones has given to you, that we have a great deal to thank him for. And I also want to say, that it is only because this Club is a growing, strong, hearty organization, that the results of the past year have been attained.

Your secretary explained the flourishing condition that we are in financially. That of course is the first requisite. We cannot be contented and happy if we are in debt. But as we are not in debt, as our treasury is well supplied, as we have a body of energetic and hard-working men, we can feel assured this Club will succeed with its work and we may well hope that during the year the secretary may have the pleasure of seeing that membership of one thousand on which his heart is set. Owing to the lateness of the hour (now 11:35 p.m.) we must bring our meeting to a close. I ask for your moral support during the year and we will certainly try to give this Club the best papers and the best work we can.

Gentlemen, we have to announce that for the March meeting the usual proceeding will be followed and the Standing Committee on Rules will

present its annual report. We have also arranged for a paper by Mr. H. M. Butts, Master Car and Locomotive Painter of the New York Central. As we are all interested in the painting of equipment I know we shall be very glad to have Mr. Butts with us and will listen with great interest to the work which he will describe. I am sure there is a large field for good work in the direction of the subject of the paper.

If there is no further business a motion to adjourn will be in order.

MR. JONES—I move we adjourn. (Seconded and carried.)

Adjourned.

NEW MEMBERS.

Admitted Since November Meeting.

Arter, W. D.....Assistant Engineer, N. Y. C. & H. R. R. R. R., 1047
Grand Central Terminal, New York City
Case, I. H.....Mechanical Engineer, Dearborn Chemical Company,
299 Broadway, New York City
Clement, Don L.....Rep. Ry. Dept. Pratt & Lambert, Inc.,
185 Madison Ave., Albany, N. Y.
Daly, Thomas J.....Assistant Foreman Car Inspector, P. R. R.,
223 Smith Street, Buffalo, N. Y.
De Witt, W. E.....Road Foreman of Engines, N. Y. C. & H. R. R. R.,
E. Buffalo, N. Y.
Fleming, D. B.....Superintendent, N. Y. C. & H. R. R. R., 226 High-
land Avenue, Buffalo, N. Y.
Ford, F. L.....Foreman, P. R. R., 320 Delaware Ave., Buffalo, N. Y.
Fosnight, P. F.....Vanadium Alloy Steel Co., 66 W. Huron Street,
Buffalo, N. Y.
Goodwin, James T....Tube Expert, National Tube Company, 40 Grove St.,
Plainfield, N. J.
Hayden, Geo. W.....General Superintendent, Gould Coupler Company,
Depew, N. Y.
Hurley, Frank J.....Salesman, Independent Pneumatic Tool Company,
170 Broadway, New York City
Jackson, Wm. M....Engineman, P. R. R., 37 Minton St., Buffalo, N. Y.
Jones, F. E.....Locomotive Engineman, P. R. R., 32 Parkview Ave.,
Buffalo, N. Y.
Jones, H. W.....General Foreman, P. R. R., Olean, N. Y.
Lynch, Chas.....Car Inspector, P. R. R., 704 W. Main St., Buffalo,
Buffalo, N. Y.

- Mason, E. F. Motive Power Inspector, P. R. R., 232 N. First St.,
Olean, N. Y.
- Newman, W. H. Signal Supervisor, N. Y. C. & H. R. R. R., 139 School
Street, Buffalo, N. Y.
- Passmore, H. E. Vice-President of Sales, Eastern District, Grip Nut
Company, Bucyrus, O.
- Pennington, R. S. Assistant Air Brake Instructor, P. R. R., 80 King-
ston Place, Buffalo, N. Y.
- Peterson, Harry P. Locomotive Fireman, P. R. R., 119 North 10th St.,
Olean, N. Y.
- Quirk, Wm. J. Assistant Foreman Car Inspectors, P. R. R., 1962
Seneca Street, Buffalo, N. Y.
- Reichle, Herman C. . . . Material Agent, P. R. R., Room 638, Brisbane Bldg.,
Buffalo, N. Y.
- Roper, D'Arcy W. Sales Manager, Buffalo Car Wheel Foundry Co.,
154 Lexington Avenue, Buffalo, N. Y.
- Rosenfelt, Samuel D. . . Franklin Railway Supply Company, 30 Church St.,
New York City
- Salisbury, W. E. Inspection of Locomotive Brick Arches, American
Arch Company, 30 Church Street, New York City
- Sitterly, O. E. Foreman Car Inspectors, P. R. R., 36 Zittle Street,
Buffalo, N. Y.
- Straub, V. Vanderbilt. Salesman, Star Brass Manufacturing Company,
Crawford House, Boston, Mass.
- Turner, Walter V. Chief Engineer, Westinghouse Air Brake Company
Pittsburgh, Pa.
- Varley, Harvey H. Clerk, N. Y. C. & H. R. R. R., 80 Albany Street,
Buffalo, N. Y.
- Welch, M. E. Trainmaster, N. Y. C. & H. R. R., 132 Blaine St.,
Buffalo, N. Y.
- Yates, Blinn. Secretary-Treasurer, Buffalo Air-Brake Company,
695 Ellicott Square, Buffalo, N. Y.

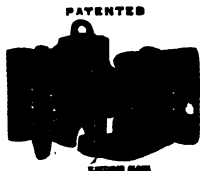
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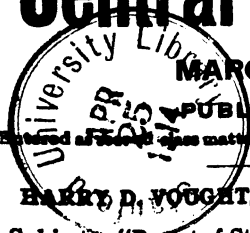


Vol. 22

OFFICIAL PROCEEDINGS

No. 2

Central Railway Club



MARCH MEETING, 1914

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Subject: "Report of Standing Committee on Rules of Interchange."

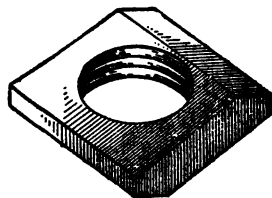
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REGULAR MEETINGS AT BUFFALO: SECOND FRIDAY IN JANUARY.
MAY, SEPTEMBER AND NOVEMBER, AND SECOND THURSDAY
IN MARCH, AT 8 P. M.

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AT NO. 95 LIBERTY STREET, NEW YORK

Contains PAPER AND DISCUSSION:

**"Report of Standing Committee on Rules of
Interchange."**

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NEXT MEETING, FRIDAY, MAY 8, 1914

The March Meeting

The regular meeting of the Central Railway Club was held at the Hotel Statler, Buffalo, N. Y., Thursday, March 12, 1914, at 2:30 P. M., with Mr. William Elmer, President, in the chair.

Those who registered as in attendance were:

Andrews, W. H.	Fosnight, P. F.	Lowell, C. E.
Ashmead, F. M.	Fryer, H. H.	Lindner, N. C.
Burwell, J. H.	Flory, B. P.	Lake, W. A.
Bucher, F. R.	Goodenough, F. H.	Lillis, De F.
Berg, A.	Getzen, J. M.	Manchester, H. C.
Ball, H. F.	Gould, J. O.	Maycock, Joseph
Baach, F. Paul	Green, Fred. V.	Mooney, W. D.
Butts, H. M.	Ganson, F. C.	Mace, John S.
Brazier, F. W.	Garvin, H. L.	McCuen, C. F.
Barker, James I.	Griffin, F. A.	McConnaghy, H. G.
Brewster, Morris B.	Goodwin, James T.	MacBain, D. R.
Chamberlin, Henry M.	Gibney, J. W.	Owens, William
Clifford, W.	Hamilton, William	Oatley, H. B.
Carson, D. J.	Harris, Elmer E.	Ord, G. H.
Carney, J. P.	Hagarty, George T.	O'Brien, Esmond P.
Charlton, George J.	Henszey, R. E., Jr.	O'Donnell, Thomas J.
Corey, Bloss P.	Hoit, W. W.	Pye, D. W.
Coyle, Walter H.	Hanson, F. H.	Potts, C. H.
Currie, J. C.	Henry, J. S.	Price, Thomas
Calkins, A. E.	Hassett, M. W.	Pugh, John P.
Carliss, Thomas E.	Hayes, Ross F.	Pickard, F. C.
Castle, Charles C.	Hegeman, Harold	Post, George A.
Cotton, W. A.	Hopkirk, Thomas H.	Quirk, W. J.
De Witt, W. E.	Hine, Charles	Rohrback, George T.
Devans, E. J.	Jones, F. E.	Russell, C. H.
Daly, Thomas J.	Jones, W. F.	Ryder, Gilbert E.
Dunham, F. C.	Jones, J. L.	Robbins, A. E.
Elmer, William	Janes, E. L.	Schlafge, William
Elliott, A. H.	Jenings, George W.	Shrader, J. R.
Frost, H. P.	Kennedy, Frederick	Sweeley, Edward A.

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Salisbury, W. E.	Turner, Alex.	Waterbury, J. H.
Senger, J. W.	Toomey, T. F.	Wagstaff, George
Sitterly, O. E.	Thompson, C. J.	Wilcox, A. F.
Syze, F. C.	Thompson, W. O.	Wey, Harry M.
Sitterly, W. H.	Taylor, W. O.	

The PRESIDENT—Gentlemen, the meeting will come to order. I might say as a preliminary statement that if you are not on better time tonight you will find the banquet half over by the time you get in. This meeting was called for 2 o'clock. We have a good deal of business to get through with and we will have to start, beginning with the next meeting, to try to get off a little more promptly, if you please.

The first order of business is the roll-call. As the cards have been distributed at the door we will dispense with the calling of the roll. The next order of business is the reading of the minutes of the meeting of January 9. Those minutes have been printed and the copies of the proceedings are in the hands of the members, therefore, we will dispense with the reading of the minutes. I want to say at this time that we have been honored by a very large delegation from New York City who have come to us on a special train over the Erie Railroad. The Secretary tells me that this is the largest delegation that has ever come to Buffalo to attend the annual dinner of the Central Railway Club, and I am sure we will all feel greatly honored and complimented by having so large a number of prominent men present. The Secretary also tells me that we have received since the last meeting 35 applications for membership. These names will be submitted to the Executive Committee but they were nearly all enrolled as soon as their dues were paid. The next order of business is the reports of standing committees. Mr. Secretary, will you give us the report of the Executive Committee?

The SECRETARY—Mr. President, the Executive Committee this morning, in a regular session, was occupied more with the consideration of plans for the remainder of this season and the season of 1914-15. The Committee believes that it has adopted a method that insures to you, notwithstanding the high-class papers you have had in the past, something even better and that will strongly appeal to you at every meeting that is held. As a result the Committee hopes that it will have a tendency to attract a very full attendance of members. The President has anticipated the report of the Executive Committee with respect to our membership, in the way of new members enrolled up to this hour. As to the financial condition of the Club, I think this is the first time it

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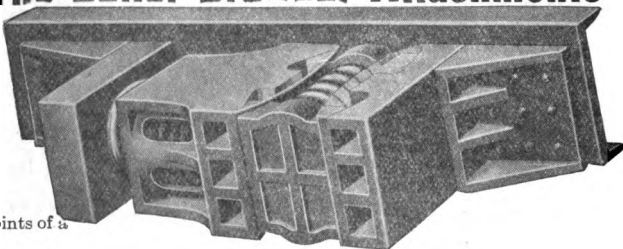
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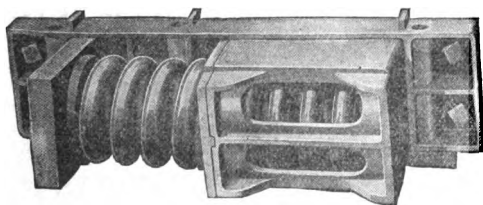
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has been possible to report at a March meeting that, notwithstanding the expenses incident to the beginning of a new year, and with the balance which was reported as accruing from the preceding year, our balance, with all liabilities paid to date, is not only unimpaired but is greater. In other words, we have over \$1100 in the treasury today. In the matter of new members we have never had as large a list at the beginning of the March session. There are 35 now, and based upon that and according to the way we receive new members at the March meeting, I think without question there is a very fair prospect of being able to show in the proceedings of this meeting when published that we have had an accession of at least 50 new members. There is nothing special to report further from the Executive Committee, Mr. President, because, as I have said, routine business and plans for the future took up so much time, and owing to the fact that there was nothing more for the Secretary to present to the Executive Committee, no more extended report is required. Furthermore, you will want to get through business here and prepare for the festivities of tonight.

The PRESIDENT—The Secretary's statement in regard to the number of new members is certainly very gratifying. It looks as if we had a good start towards that thousand that we want to roll up before the end of the year. The next order of business is the report of the standing committee on Rules of Interchange, Mr. W. H. Sitterly, Chairman. Gentlemen, if there is no objection, as Mr. Sitterly reads each of these paragraphs, we will assume that the endorsement of the Central Railway Club follows. If anyone has any suggestion to make or questions to offer, as soon as the reading of the paragraph is finished let him talk up so that we can have the discussion then and there.

Mr. Sitterly then read the report of the Committee on Rules of Interchange.

Mr. Fritts moved that the time "October 1, 1915," in Rule 35 be changed to "October 1, 1917." The motion was duly seconded and lost.

Mr. Fritts moved to have Rule 35 read that you cannot demand a defect card for an M. C. B. journal bearing.

The President suggested that Mr. Sitterly confer with the other members of the Committee concerning that subject.

Mr. SITTERLY—Two-thirds of the Committee are present, Mr. President, and the Committee is willing to change that recommendation to read so as to cover any journal bearings that are applied that are not M. C. B. standard in size or type. There was another thought that I did not get at that time; that was, in addition, to eliminating the sizes that are not M. C. B. standards, also to eliminate the spiral bearing. Is that acceptable to you, Mr. Fritts?

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Mr. FRITTS—Yes.

Mr. SITTERLY—We will incorporate that and send it to the Secretary, if you say all right, Mr. President.

The PRESIDENT—That now being the changed report of the Committee, is there any further discussion on that particular point in regard to Rule 35? The committee have agreed to modify this suggestion and the minutes of the meeting will show that that rule is corrected and when the reports are sent to the membership the previous modification of the rule will be in its new form.

Mr. Fritts moved that the suggestion or recommendation made by the committee to eliminate the words "cut journal" from Rule 84 be eliminated from this report.

Seconded and carried.

The PRESIDENT—Now, gentlemen, the report of the committee as a whole is before you and the motion to adopt the report as a whole, with the corrections that have been made will be in order.

A motion was duly made, seconded and carried, that the report of the committee be adopted as a whole.

REPORT OF STANDING COMMITTEE ON RULES OF INTERCHANGE.

GENTLEMEN.—Your Committee on the revision of Master Car Builders' Rules of Interchange submit herewith, for your consideration, the following report:

RULE 2, first paragraph, omit from the third line the words "Offered in" and add to the word interchange the letter "d."

REASON: The receiving line being judge of cardable defects, cars should be carded at the time of interchange and not before.

We would suggest that the Arbitration Committee recommend to the American Railway Association that paragraph "b" of rule 3 be changed to read: "The car owner shall have the right to demand the return of his empty cars at the junction point where delivered loaded if in safe and serviceable condition." This suggestion is made with the view of delivering the car to the owner's nearest shop.

RULE 2, page 4, opposite paragraph "c" on the margin in brackets, place the words "Initial road responsible."

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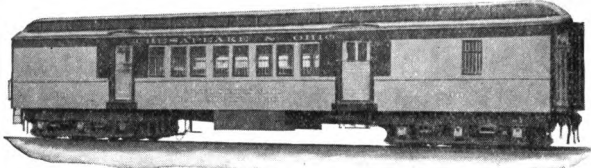
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REASON: Various commodities are loaded in closed cars at initial point without the necessary doorway protection as per M. C. B. Loading Rules, and the doors are not in distress until they reach the second or third line, thereby making the delivering company who did not participate in the loading of the car responsible for the adjustment or transfer. It is the thought of this committee that this will be the means of inducing the initial road to educate the shipper as to how the commodities should be loaded, also the necessity for doorway protection in accordance with the M. C. B. Loading Rules, as at the present time this diversion from the rules is placing the burden of the expense for transferring and adjusting on a great many roads that received but a short haul and who are not responsible for the first loading of the car.

RULE No. 4. Change reference in fourth line to read 58 instead of 57, also in last line omit reference to rules 35, 58 and 66 and add rules 56 and 57.

REASON: To conform to decisions of Arbitration Committee.

RULE No. 9. M. C. B. Couplers or parts thereof, R. & R. Omit word "Stem" in bracket after first paragraph.

REASON: Cars so equipped are not acceptable after October 1, 1914. In the fourth bracket, first line, change the words "Make or Name" to "M. C. B. Beam No. 1 or No. 2."

REASON: We feel that an arbitrary price should be set based upon M. C. B. Specifications both No. 1 and No. 2.

Page 7, first paragraph. Omit word "or" in first line, insert "comma" and add after word "Cylinder" the words "or centrifugal dirt collector."

REASON: This information is necessary.

RULE No. 10. Second paragraph, change to read as follows: "In all cases of forged or rolled steel wheels, the actual thickness of tread before and after turning off must be shown, measured from base line of tread to the condemning limit of tread, which is above witness groove, as determined by gauge as shown on sheet M. C. B. C-1 of Recommended Practice; also show actual thickness of tread on other wheels applied. This information must be reported to car owners regardless of whether repairs are chargeable or not."

REASON: To provide for accurate information as based on a new or standard flange contour.

RULE No. 14. Eliminate the second paragraph and in its place substitute the suggestion made by the Western Railway Club and Chief Interchange Inspectors' Association as shown on page 322 of No. 1 book of 1913 M. C. B. Proceedings.

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REASON: It has been a common practice and does not provide for the designation of any defects on the car body.

RULE No. 15. Change to read as follows: "Duplicate defect, billing repair or joint evidence cards, must be furnished promptly on request, for lost or illegible cards."

REASON: To improve the wording of the rule.

RULE No. 17. Change third paragraph to read: "Pressed steel, cast steel, malleable and grey iron M. C. B. standards may be substituted for each other, charges to be on basis of material applied and the credits on basis of material removed."

REASON: To encourage use of all M. C. B. standards and to remove penalty that now prevails in old rule, when standards other than cast iron are used.

RULE No. 17. Change fourth paragraph to read: "When necessary to renew brake beams on cars of less than 80,000 pounds capacity or under 132,000 pounds maximum weight, any metal brake beam meeting M. C. B. specification No. 1 must be used, and on cars of 80,000 pounds capacity or over 132,000 pounds maximum weight, any metal brake beam meeting M. C. B. Specification No. 2 must be used. If hangers or other parts are altered, defect card shall be furnished for the detail altered."

REASON: M. C. B. Specifications designate these two classes of beams and this is all that is sufficient for the braking power of these classes of equipment. Paying for hangers or other parts should be sufficient penalty.

RULE No. 17. New paragraph to be added following fourth paragraph, as follows: "After October 1, 1915, metal brake beams not conforming to M. C. B. Specifications for No. 1 or No. 2 beams and so marked must not be used in repairs to foreign cars."

REASON: To enforce use of M. C. B. Specifications for standard beams Nos. 1 and 2 and marking of same on brake beam strut.

RULE No. 18. Eliminate second paragraph account stem attachments not being acceptable in interchange.

Change third paragraph to read: "Cars having couplers with stem or spindle attachments or American continuous draft rods will not be acceptable in interchange unless enroute home."

To allow cars to move home to owners.

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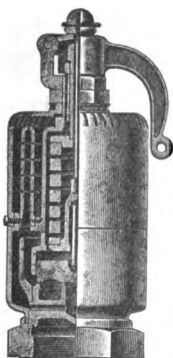
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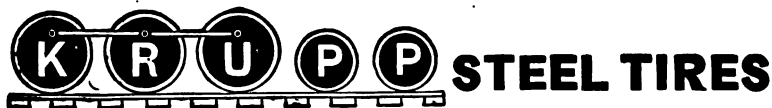
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RULE No. 19. In the last line between the words "malleable or" insert the word "filled," making it read: "malleable, filled or steel back journal bearings."

REASON: Most roads are using solid journal bearings and are in their place getting filled journal bearings when repairs are necessary. It is felt this is an inferior article and detrimental to the service of the car.

RULE No. 20. First paragraph, in third line change the word "may" to "must" and add to paragraph as follows: "Where construction of car and trucks precludes the common methods of adjusting coupler heights, the application of metal shims between journal boxes and arch bars will be permissible."

REASON: To provide for adjustment of coupler heights on cars that cannot otherwise be taken care of.

RULE No. 21. Add the following clause: "Also for applying temporary hand rails to flat cars with well holes and for applying temporary transverse tie rods to cars with sides spread or bulged beyond the clearance limits of the handling line."

REASON: Car owners should pay cost of making cars safe for trainmen. The spreading of sides of cars due to weak construction is a condition for which owners are responsible, and cost of applying temporary tie rods should not be assumed by handling line.

RULE 33. Insert new rule as follows: "On cars equipped with United States Safety Appliances or United States Safety Appliances Standard, and so stencilled, the renewal or repairs to side and end ladders or ladder treads, side and end hand holds, sill steps and brake staff, unless the brake shaft is bent or broken due to lading shifting." Delivering Line Responsible.

REASON: Cars equipped as above will not become defective in fair service.

RULE No. 35. Eliminate first paragraph, as cars with stem or spindle attachments will not be acceptable in interchange.

Add a paragraph to read as follows: "Where it is necessary to use an M. C. B. standard journal bearing on an axle having journal other than M. C. B. standard size, defect card for wrong repairs should not be requested."

REASON: The railroad companies should not be forced to carry in stock other than M. C. B. sizes.

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Change second paragraph to read: "Cars equipped with couplers having stem or spindle attachments or American continuous draft rods will not be accepted in interchange unless enroute home."

Same explanation as for rule No. 18.

Third paragraph, preceding the word "cars" in the first line insert the word "foreign" and add to paragraph "unless enroute home."

REASON: To allow owners to care for the stencilling of their own cars. Eliminate last paragraph account of being covered by rule 66.

RULE No. 37. Make rules 37, 39 and 40 vacant and change the words "(Rules 37 to 42 inclusive)" as now printed below the heading of rules in question, to read "(Rules 41 and 42.)"

The above recommendation is made because wooden and composite underframe cars are not sufficiently strong to stand up in the general service, and car owners should assume the responsibility for damage other than covered by rules 41 and 42, unless caused by unfair usage, derailment or accident. (The word composite in the heading of these rules does not include a car having steel center sill construction.)

RULE No. 41. Change the word "two" to "three."

REASON: This allows for the broadening of combinations mentioned in rules 37, 39 and 40.

Eliminate first and second foot notes on page 27.

REASON: As cars designated in first foot note will not be accepted in interchange after October 1, 1914. With the elimination of rules 37 and 39, the second foot note will be ineffective.

Change the third foot note as follows: Make the word "combinations" singular instead of plural.

REASON: To agree with suggestion for elimination of rules 37, 39 and 40.

RULE No. 43. Extend bracket on left to include heading "All-steel underframe or All-steel cars."

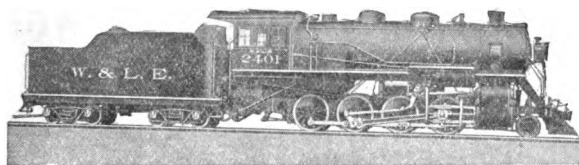
REASON: In order that this heading may be properly interpreted as applying to rule 43 only.

We would recommend that the committee on Standards present to the Arbitration Committee for incorporation in the M. C. B. Proceedings, effective October 1, 1914, the proper sectional area for steel center sill construction for all steel and steel underframe cars.

RULE No. 44. Insert new rule as follows: "Tank cars having leaky tanks, unless such leaks were caused in wreck, derailment, cornering or sidwiping."

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REASON: To overcome controversies between railroads and tank car owners.

RULE No. 52. First paragraph. Eliminate this paragraph and substitute the following: "All safety appliances when renewed or removed for repairs must be secured in accordance with Interstate Commerce Commission requirements."

REASON: This to conform more closely with the law and in order that more adherence to I. C. C. regulations will be had.

At the end of second paragraph of rule 52, add the words "except as provided for in rule 33."

RULE No. 57. Cut of air hose and label on page 31 to be modified so as to show that label is located within 6" of hose coupling. This to harmonize with M. C. B. Specifications.

Change third paragraph to read: "No new hose should be applied unless it bears the revised band label."

Change fourth paragraph to read: "M. C. B. standard hose now in service will not be penalized."

RULE No. 60. Add sentence to third paragraph of this rule as follows: "Old markings must be erased before new stencilling is applied."

If not removed, this is confusing.

RULE No. 69. Eliminate from this rule after the figure "78" the second and third and fourth lines up to the word "broken."

REASON: We feel that this should be included in owners' defects due to the fact that the causes in many cases are the same.

RULE No. 82. Eliminate the word "the" in the first line, and in the second line the words "opposite", "from," and "throat," and substitute after the word "on" the word "either." In the last line change figures $1\frac{1}{2}$ to $1\frac{3}{4}$.

REASON: The same as those given for rule 69, and the change from $1\frac{1}{2}$ inches to $1\frac{3}{4}$ inches is to allow a greater margin in cutting out cars, as we feel a wheel can be chipped to the extent of $1\frac{3}{4}$ inches without any detriment or danger.

RULE No. 83. Cut of wheel defect and worn coupler limit gauge to have notch shown indicating 2" measurement for flat spots on wheels.

REASON: This to cover the addition made to M. C. B. Rule 68 for the 1913 rules.

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RULE No. 84. Eliminate the words "cut journals" from this rule.

REASON: We believe this should be included in owners' defects. We feel that as many of our hot boxes are caused by mechanical defects as are caused by lack of lubrication.

RULE No. 85. Preceding the word "axles" insert the words "cut journals." This should be included in owners' defects.

RULE No. 86. Under the heading of maximum weight opposite maximum weight 79,000, which compares ordinarily to a 50,000 pounds capacity car in sizes, the wheel seat is given in the rule as five and one-quarter inches. We believe this is a typographical error.

RULE No. 87. Eliminate reference to rule 35. On account of change in rule 35.

RULE No. 90. Eliminate reference to rule 35. On account of change in rule 35.

RULE No. 93. Add to second paragraph "unless otherwise designated in the Equipment Register."

REASON: To take care of any leased cars operated by a railroad company.

RULE No. 98. Page 51. The portion of the paragraph from the start to first "comma" to be changed to read as follows: "If new wheels and axles are substituted for average credit wheels and second-hand axles," (remainder of paragraph as now in effect.)

REASON: This change is made to harmonize with average credit price for wheels, instead of second-hand and scrap wheels.

PAGE 52. The price of forged steel wheels shall be based on the scrap value of \$4.50 for the metal inside the condemning limit, which is $\frac{1}{4}$ " above the limit groove, plus 62.5c for each 1-16 inch of service metal (on radius of tread) outside of the condemning limit.

This eliminates the price of \$19.50 for a new wheel from table on page 51.

RULE No. 98. Page 52. Delivering Line Defects. This paragraph to be modified by omitting the words "but no" in third line and substituting the word "and."

REASON: As owners are benefitted by increased service metal.

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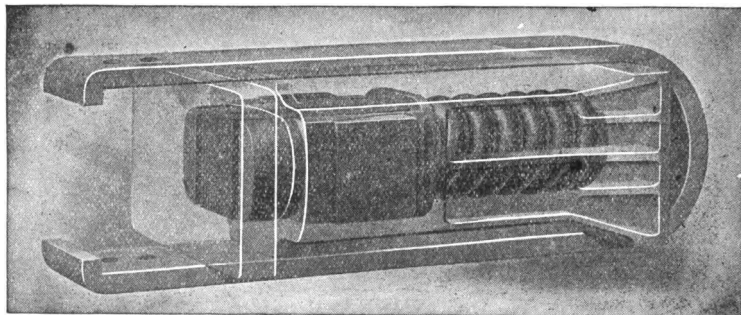
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PAGE 53. Delivering Line Defects. This paragraph to be modified by placing a period after the word "owner" in 17th line and eliminating the remainder of this paragraph.

REASON: As owners are benefitted by increased service metal.

PAGE 53. The paragraph starting on last line of this page to be modified by changing the period after the last word in the paragraph to a comma and adding to the paragraph as follows: "provided tread or service metal would not have to be reduced below that amount to obtain full flange contour."

This change is made as party repairing or replacing forged or rolled steel wheels due to flat spots should not be responsible for service metal that was in no way affected by the flat spots, viz: as service metal must always be considered in connection with the flange of the same wheel.

RULE 101.

PAGE 55. Add "Cylinder Front Cap Gasket (New York Triple) .15

PAGE 55. Add "Brake Beams No. 1 and Brake Beams No. 2." We feel that this will simplify the billing. Price Committee should fix a price for the beams in question.

PAGE 57. Add additional item after "Triple Vent Piston" reading: "Other Air Brake Material at catalogue prices."

PAGE 57. Add the following additional items:

Altering height of one end of car by adjusting center plates and side bearings, net.....	\$1.40
Altering height of one end of car by adjusting body bolsters, net	3.75
Altering height of one end of car by metal shims between top of journal box and arch bars, net.....	2.00

PAGE 59. Change item of spring cotters as follows:

Spring cotters or split keys, each, applied, when not used in application of other parts.....	.03
---	-----

REASON: When brake pins, knuckle pins, release valve rods, uncoupling clevises, etc., are applied, such application includes the application of spring cotters or split keys, while the charge for such repairs is sufficient to absorb the trivial value of the spring cotter or split key.

RULE No. 104. Make this addition: "In case of defective brake beams removed when another make is applied, credit shall be confined to the beam section, heads, fulcrum and truss rods on trussed beams."

REASON: This would make the credits allowed uniform.

RULE No. 107. Page 64. After item "Carlin, one renewed" introduce new item "Carlin, one replaced, when out of place," hours $1\frac{1}{4}$, with charge of \$.35 for ordinary cars.

REASON: This item to provide a price for replacing a carlin when out of place. Price for renewing a carlin does not apply.

PAGE 64. Bolts. Change to read: "Journal box bolt or column bolt, one, replaced, $1\frac{1}{2}$ hours, etc.

Each additional, replaced in same truck, $\frac{1}{2}$ hour, etc."

PAGE 64. Center pin (key) add after word "key" the words "or plain."

PAGE 67. Eliminate the item "Hand holds straightened on car, one or two."

REASON: We do not feel that this is a good practice.

PAGE 68. Add at bottom of page, "Running boards, to secure with screws, per lineal foot of single board, \$.01."

REASON: To provide for screwing running boards previously nailed.

PAGE 68. "Renailing roofing and siding," should read "Renailing roofing, siding or lining, per lineal foot, \$.015."

PAGE 70. Would recommend that the following be inserted following sixth item "One intermediate sill, short, for hopper cars, 14 hours."

We have no M. C. B. prices for short intermediate sills.

PAGE 70. "Two intermediate sills, short, for hopper cars, at one end of car, 16 hours."

Same explanation as above.

PAGE 72. "Truck truss rods, center, one renewed," change allowance to nine hours.

REASON: To conform to price for truck bolsters.

PAGE 72. "Truck spring, replacing, one or cluster, when out of place, empty or loaded car." No change in hours.

The words "empty or" have been added. This should be a uniform charge for either an empty or loaded car.

Under the item of "turnbuckle," page 73, insert "uncoupling lever renewed."

REASON: This to make charge uniform, the price to be made by price Committee.

A price should be added for the labor of applying a double end splice to a side sill in the center of a car. This is not now covered.

RULE 110. After the second paragraph on page 75, insert the following paragraph: "Applying center plate bolts, when one or two draft timbers extending beyond body bolster are renewed at the same end."

Save Steps and Delays by Making Immediate Power Changes

To change the speed of a mechanically driven machine it is often necessary to stop it, go hunt for belt stick, start it again, shift belt to top cone of pulley, see if speed is too high and has burnt or taken the edge off tool, stop machine, regrind tool, start machine again. Sometimes the belt slips off cone pulley and more delay results.

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REASON: Some roads charge extra for renewing top center plate bolts on opposite timber when one of the long draft timbers are applied, which we do not believe is proper, as the charge for renewing all center plate bolts at one end is covered in the application of the draft timbers.

RULE No. 115. Change second hand value of wheels to credit value in second paragraph.

RULE No. 116. First paragraph, change to read as follows: "The settlement prices of new eight wheel cars shall be as follows, with an addition of \$27.50 for each car equipped with 8 inch air brake equipment and \$35.00 for 10 inch air brake equipment. Where the cost per pound is given as a basis for settlement, the new weight of car body (including weight of air brakes and all parts attached to body of car as originally and completely built) is to be used in order to simplify calculations. The road destroying a car may elect to return the air brake apparatus as usually furnished by the air brake manufacturer, complete and in good condition."

REASON: The above to make clear what parts are included in weights where pound basis is used for settlement.

We would recommend that the price committee make provisions in rule 116 for a price for the later type of car, which has the steel superstructure framing, all steel siding, all steel roofing and steel ends. This, of course, will cover cars having all of these items or any one separately.

PAGE 86. Second paragraph, change to read: "When cars are equipped with metal center sills or with metal center underframes, combining center sills and metal wing bolster, the following prices shall be added to the value of bodies for cost of such center sills and such center underframe:

Center sills less than 10" deep.....	\$60.00
Center sills 10" deep or more.....	80.00
Center underframes and metal wing bolsters, with center sills having a cross-sectional area of 22 square inches or more.	120.00

We believe some action should be taken with reference to rule 120, as at the present time it is working a hardship on some of the roads. The true spirit of the rule is carried out by the railroad having the car in its possession and endless correspondence is carried on before home route cards are obtained. In some instances they are refused and in others where they are furnished, when the car reaches the home shop exceptions are taken to the joint report as submitted by the handling line. We believe that a limit for repairs that the handling line should make before the car is turned back to the owner on home route cards should be placed before a committee from the M. C. B. Association.

RULE No. 122. In the last paragraph, eliminate the word "hairfelt."

REASON: Account of the various thicknesses and different styles of insulation used.

A. R. A. RULE No. 15.

It is suggested that this rule be changed by adding a paragraph after paragraph "F" to read as follows:

"The initial road shall pay the cost of transfer or re-arrangement of closed cars when transfer or re-arrangement is due to contents being improperly loaded according to M. C. B. Loading Rules."

REASON: The same reason as suggested for change in A. R. A. Rule 3, paragraph "b."

It is the opinion of this committee that the Arbitration Decisions should be gone over by a competent committee of the M. C. B. Association and the obsolete cases destroyed.

PASSENGER CAR CODE OF RULES.

RULE 3. Owners' defects, add as follows:

"Equipment and tools missing from the inside of baggage, mail and express cars is an owner's defect when missing at the time of unloading."

REASON: These cars usually come on to a line locked or sealed and there is no opportunity of inspection until the time of unloading.

W. H. SITTERLY, G. C. I., Penna. R. R., *Chairman*
 T. J. O'DONNELL, Arbitrator, N. F. C. I. A.
 R. S. MILLER, G. F. C. D., N. Y. C. & St. L. Ry.
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 C. E. SPOOR, M. C. B., B. & S. R. R.
 F. PAUL BAACH, F. C. I., Buffalo Creek R. R.

The PRESIDENT—The next order of business is concerning the paper for the next meeting. The Executive Committee this morning discussed the topic for the paper to be presented at the next meeting and there is still some doubt as to the possibility of getting the paper that we want. We can say, however, that we hope it will be a very interesting paper and the Secretary will send out the proper announcement in ample time. Is there any further business?

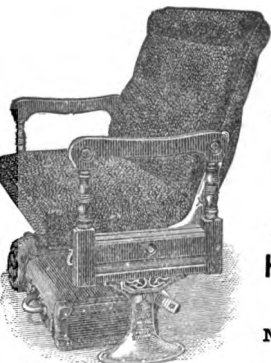
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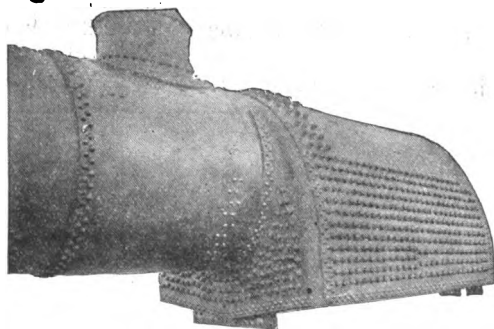
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The SECRETARY—Mr. President, I would like to announce that we have 41 applications for membership at this time. I would suggest that we omit reading the names now and the entire list will be published in our proceedings.

Mr. MANCHESTER—I move that a vote of thanks be tendered to the Committee on Rules of Interchange for the excellent work it has done in preparing this report,

Seconded and carried.

On motion the meeting then adjourned.

NEW MEMBERS ENROLLED

Andrews, W. G. Pratt & Lambert, Buffalo, N. Y.

Ashmead, Frank M. Civil Engineer, The Pennsylvania Railroad,
135 Richmond Avenue, Buffalo, N. Y.

Bannister, William P. Locomotive Engineer, P. R. R.,
90 Duerstein St., Buffalo, N. Y.

Brehm, A. A. Agent, P. R. R., Buffalo, N. Y.

Brigham, H. R. Road Foreman of Engines, P. R. R.,
126 St. James Place, Buffalo, N. Y.

Brown, Harold A. Eastern Rep., Pocket List of R. R. Officials,
75 Church St., New York City

Burwell, J. H. Ry. Supplies, 2040 Grand Cen. Term., N. Y. City

Calkins, C. H. Chief Train Master, N. Y. C. & H. R. R. R.,
707 Richmond Ave., Buffalo, N. Y.

Chace, R. T. Salesman, Westinghouse Elec. & Mfg. Company,
780 Ellicott Square, Buffalo, N. Y.

Chidley, James. Asst. Supt. Motive Power, L. S. & M. S. R. R.,
Cleveland, O.

Coffin, J. S. Jr. Mechanical Dept., Franklin Ry. Supply Co.,
30 Church St., New York City

Cooke, G. T. Eastern Mgr., Chicago Car Heating Co.,
Grand Central Terminal, New York City

Coyle, Walter H. Vice-President, Franklin Ry. Supply Co.,
30 Church St., New York City

Craig, G. M. Asst. General Pass. Agent, Erie Railroad,
50 Church St., New York City

Dickson, E. J. Vice-President, International Railway Co.,
Buffalo, N. Y.

Dunham, T. P. Ry. Rep., The Garlock Packing Company,
Northumberland, Pa.

- Elliott, William J. Salesman, The Transportation Utilities Co.,
30 Church St., New York City
- Frost, H. F. Salesman, Carborundum Company,
Niagara Falls, N. Y.
- Gaiser, W. B. Locomotive Engineman, P. R. R.,
224 William Street, Buffalo, N. Y.
- Gardner, G. Clinton Jr. . . . Asst. Engineer of Motive Power, P. R. R.,
623 Brisbane Building, Buffalo, N. Y.
- Gentner, Fred. Locomotive Engineman, P. R. R.,
22 Zittle St., Buffalo, N. Y.
- Graham, Charles W. Manager, Collosens Cement Company,
51 Hamburg St., Buffalo, N. Y.
- Hayward, H. S. Jr. President, Roybel Packing Company,
30 Church St., New York City
- Hoffhine, John. Inspector, Amer. Brake Shoe & Foundry Co.,
30 Church St., New York City
- Hopkins, C. C. Sales Agent, American Steel Foundries,
202 Society For Savings, Cleveland, O.
- Ingalls, A. S. General Superintendent, L. S. & M. S. R. R.,
Cleveland, O.
- Jones, Bert L. Vice-Pres. & Gen. Mgr., Niagara Gorge R. R.,
604 Ellicott Square, Buffalo, N. Y.
- Lowell, C. E. Salesman, Standard Heat & Ventilation Co.,
141 Cedar Street, New York City
- MacArthur, C. P. Principal Assistant Engineer, P. R. R.,
Brisbane Building, Buffalo, N. Y.
- McConnaghy, H. G. Mgr., Dearborn Drug & Chemical Co.,
165 Broadway, New York City
- McCuen, C. F. Vice-Pres., Standard Heat & Ventilation Co.,
141 Cedar Street, New York City
- McMullen, John. Mechanical Superintendent, Erie Railroad,
19 Weyand Street, Buffalo, N. Y.
- McNoldy, Wm. H. Foreman, Machine Shop, P. R. R.,
235 N. 3rd St., Olean, N. Y.
- Mace, John S. Salesman, The U. S. Metallic Packing Co.,
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- Marts, Geo. H. B. Locomotive Engineman, P. R. R.,
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- Merzig, John. Locomotive Engineman, P. R. R.,
103 Imson St., Buffalo, N. Y.
- Moon, R. F. Salesman, Westinghouse Elec. & Man. Co.,
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- Ord, G. H. Rep., Transportation Utilities Company,
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- Randolph, John L. Eastern Sales Mgr., Economy Devices Corp.,
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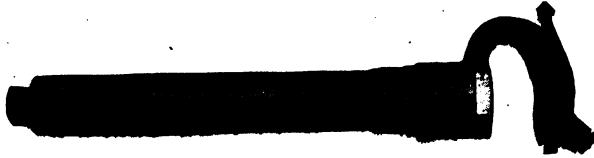
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- Schlafge, William Gen. Mechanical Supt., Erie Railroad,
50 Church St., New York City
- Senger, J. W. Dist. M. C. B., L. S. & M. S. R. R.,
Collinwood, O.
- Smith, H. J. General Car Inspector, D. L. & W. R. R.,
Scranton, Pa.
- Starr, Theodore D. Salesman, William C. Robinson & Son Co.,
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- Syze, Frederick C. Trainmaster, B. & O. R. R., St. George,
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- Talkes, Louis N. Manager, The U. S.- Light & Heating Co.,
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- Taylor, A. A. Mgr., Railroad Dept., Fairbanks, Morse & Co.,
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- Tompkins, H. M. Superintendent, L. S. & M. S. R. R.,
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- Whitney, F. H. Rep., Westinghouse Air Brake Company,
165 Broadway, New York City
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- Wilson, James W. Salesman, Imperial Car Cleaner Company,
115 Chestnut St., Newark, N. J.

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Twenty-fourth Annual Dinner at the Hotel Statler

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Memorable Welcome of President William Elmer—First Experience of Vice-President D. R. MacBain Proves Him a Past master In the Duties of a Toastmaster—Presentation to Past President W. F. Jones by Vice-President H. C. Manchester—Spirited Addresses of the Hon. George A. Post, Major Charles Hine and Samuel B. Botsford.

The twenty-fourth annual dinner of the Club was served in the evening in the beautiful banquet hall of the Hotel Statler. As in all previous years it afforded unlimited pleasure to all who were present. The attendance of members, the unusually large number of attractive women who graced the occasion with their presence, the special guests, and a bigger delegation than ever before from New York who had journeyed to Buffalo by a special train over the Erie railroad for the sole purpose of participating, made up a happy throng of nearly 500 revelers. They gave high praise to the members of the Entertainment Committee—Mr. Elmer E. Harris, Chairman, Mr. T. F. Toughey, Mr. Frank Tuma, Mr. H. C. Edson, Mr. James W. Gibney, Mr. C. H. Russell and Mr. James I. Barker—for the highly commendable manner in which they had made the arrangements and for making their first thought the comfort of the guests.

The New York delegation, numbering more than 50, was headed by its Chairman, Mr. Charles C. Castle, Manager of the Railroad Department of the U. S. Metal & Manufacturing Company. Accompanying him were Mr. D. W. Pye, President of the Transportation Utilities Company and Chairman of the finance committee of the Club; Mr. Frederick C. Syze, Trainmaster of the Baltimore & Ohio and First Vice-President of the New York Railroad Club; Mr. Burton P. Flory, Superintendent of Motive Power of the New York, Ontario & Western and Second Vice-President of the New York Railroad Club; Mr. F. W. Brazier, Superintendent of Rolling Stock, New York Central, and Mr. A. E. Calkins, his assistant; Mr. Herman F. Ball, President Economy

Devices Corporation and a Past President of the Central Club; Mr. H. M. Butts, Master Car and Locomotive Painter of the New York Central; Mr. William Schlafge, General Mechanical Superintendent of the Erie and Mr. W. A. Cotton, Chief Clerk of Mr. Schlafge's department; Mr. Alex Turner, Vice-President, Bronze Metal Company; Walter H. Coyle, Vice-President, and Mr. E. L. Janes, of the American Brake Shoe & Foundry Company; Mr. Ross F. Hayes, Eastern Manager, the Curtain Supply Company; Mr. Esmond P. O'Brien, Assistant to the President, Brady Brass Company; Mr. J. C. Currie, Nathan Manufacturing Company; Mr. F. C. Dunham and Mr. Harold A. Hegeman, U. S. Metal & Manufacturing Company; Mr. E. M. Hedley and Mr. W. O. Taylor, Galena Signal Oil Company; Mr. W. A. Lake, Pantasote Leather Company; Mr. De F. Lillis, of the Grip Nut Company; Mr. J. T. Goodwin of the National Tube Company; Mr. George Wagstaff, and Mr. W. E. Salisbury of the American Arch Company; Mr. Gilbert Ryder of the Locomotive Superheater Company, and Mrs. Ryder; Mr. A. H. Elliott and Mr. G. H. Ord of the Transportation Utilities Company; Mr. W. W. Hoit of the Railway Appliances Company; Mr. Fred V. Green and Mr. F. H. Whitney of the Westinghouse Air Brake Company; Mr. J. S. Henry, Manager Northeastern District, Safety Car Heating & Lighting Company; Mr. Thomas H. Hopkirk, and Mr. J. R. Stuart, of the American Steel Foundries; Mr. C. E. Lowell, Standard Heat & Ventilation Company; Mr. Joseph Maycock, Pratt & Lambert; Mr. H. G. McConnaghy, of the Dearborn Chemical Company and Secretary of the Electric Railway & Manufacturers' Association; Mr. Henry B. Oatley of the Locomotive Superheater Company; Mr. A. E. Robbins, of the Gold Car Heating Company; Mr. Harry Whitehair of the Chicago Varnish Company; Mr. J. H. Burwell and Mr. G. M. Craig, Assistant General Passenger of the Erie Railroad.

Seated with President Elmer at the Speakers' table were the Hon. George A. Post, Major Charles Hine, Mr. Samuel B. Botsford, Major Harry Hill Bandholts, of the United States Army, Commandant of Fort Porter; Mr. H. F. Ball, Past President of the Club; Mr. H. C. Manchester, Superintendent of Motive Power and Equipment of the Lackawanna, and First Vice-President of the Club; Mr. E. J. Devans, General Superintendent of the Buffalo, Rochester & Pittsburgh and Second Vice-President of the Club; Mr. D. R. MacBain, Superintendent of Motive Power of the Lake Shore & Michigan Southern and Third Vice-President of the Club; Mr. D. W. Pye, President of the Transportation Utilities Company.

PRESIDENT ELMER—The time has arrived for me to make a few remarks and turn over the custody of this impressive gathering to the Toastmaster, who will conduct the further proceedings with the dignity and efficiency that always characterizes Lake Shore leadership. Now I want to read some letters of regret—just a few. I won't read them all.

ERIE RAILROAD COMPANY
OFFICE OF THE PRESIDENT

New York, March 5, 1914.

Mr. W. Elmer, President, Central Railway Club, Buffalo, N. Y.

MY DEAR SIR: Referring further to your kind favor of January 20th with reference to the annual banquet of the Central Railway Club to be held at Buffalo on March 12th.

Greatly to my regret I find I shall be unable to be present on that occasion for the reason that I am called to Chicago to attend a meeting on that date. I trust that the banquet will be both pleasant and profitable, and with renewed regrets, beg to remain,

Very truly yours,

F. D. UNDERWOOD.

NEW YORK CENTRAL LINES
GRAND CENTRAL TERMINAL

New York, January 29, 1914.

Mr. Wm. Elmer, President, Central Railway Club, Buffalo, New York.

MY DEAR SIR: I am in receipt of your favor of the 26th instant, extending to me on behalf of the Central Railway Club an invitation to be their guest at the annual banquet to be held at the Hotel Statler on the evening of Thursday, March 12th, 1914; and thank you for same.

I am sure this affair will be a delightful one, and while I would esteem it a great pleasure indeed to be with you on this occasion, owing to the fact that I am subject to a call at the advance rate case hearings which are to be resumed at Washington early in March, and have several other important matters which will require my attention about that time, I am obliged to avoid making any engagements of this nature; and am, therefore, constrained to decline your very kind invitation.

Regretting very much my inability to avail myself of the courtesy extended to me by yourself and the Executive Committee, believe me,

Very truly yours,

A. H. SMITH.

THE PENNSYLVANIA RAILROAD COMPANY

Philadelphia, January 22, 1914.

Mr. William Elmer, President, Central Railway Club, Buffalo, New York.

MY DEAR MR. ELMER: I am in receipt of your letter of January 20th and very much appreciate your courteous invitation to be present at the annual banquet of the Central Railway Club, to be held at Buffalo on the evening of March 12th.

Unfortunately, I am unable at this time to make any positive engagement for that date, as it is quite possible that I shall be away at that time, so that I would ask that you do not count upon my being present.

With best wishes that the banquet may be a successful and enjoyable one, I am,

Yours very truly,

W. W. ATTERBURY, Vice President.

TELEGRAM

Phila., March 11, 1914.

William Elmer, Buffalo, N. Y.

I very much regret that my contemplated visit to Buffalo to attend the annual banquet of Central Railway Club tomorrow will not be possible.

Inasmuch as your club inures to the personal benefit and pleasure of the individuals as well as to the companies in whose services the members are engaged, I trust the Central Railway Club may continue to grow in importance and usefulness.

S. C. LONG.

THE PENNSYLVANIA RAILROAD COMPANY
OFFICE OF GENERAL SUPERINTENDENT MOTIVE POWER

Altoona, Pa., January 22, 1914.

To Mr. William Elmer, President, Central Railway Club, Buffalo, N. Y.

MY DEAR MR. ELMER: In acknowledgment of your courteous letter of January 20th: I appreciate highly your invitation to attend the Annual Banquet of the Central Railway Club on Thursday, March 12th next, but fear that I could not spare the time.

Thanking you for your thoughtfulness, and regretting that I cannot avail of your cordial invitation, I remain,

Yours very truly,

J. T. WALLIS.

THE DELAWARE, LACKAWANNA & WESTERN RAILROAD CO.

New York, January 24th, 1914.

Mr. William Elmer, President, Central Railway Club, Buffalo, N. Y.

MY DEAR MR. ELMER: I thank you very much indeed for your kind invitation of the 20th instant to be present as the guest of the Central Railway Club at its annual banquet in March, and I would be very glad to be able to accept. Unfortunately, however, I have made arrangements to be in the south during the greater part of the month of March and at the time of your dinner and therefore am obliged to decline.

Wishing you a very enjoyable occasion, I am,

Yours very truly,

GEO. A. CULLEN,

Passenger Traffic Manager.

New York, March 11th, 1914.

Mr. W. Elmer, President, The Central Railway Club, Buffalo, N. Y.

DEAR SIR: Replying to yours of the 10th instant, I appreciate your kindly words very much.

As explained to your Secretary it is simply a human impossibility to visit Buffalo at this time. Am taking an unusual interest in the dinner this year, to use a baseball expression, batting one thousand per cent.

We are sending our Mr. Esmond P. O'Brien as our representative. It is pertinent to add my interest in railway clubs of today is just as keen and active as it was forty years ago.

With kindest personal regards, I remain,

Very truly yours,

D. M. BRADY.

Albany, March 12th, 1914.

Harry D. Vought, Secretary Treasurer, Central Railway Club, Buffalo, N. Y.

Will you kindly express to President Elmer my regrets for inability to return in time for the dinner. Am glad our big annual retains its reputation for having such notable guests to entertain and instruct our people.

GEO. W. SMITH.

THE PRESIDENT'S WELCOME

First; I have much pleasure in welcoming to this meeting the large number of ladies, who have paid tribute to the membership of the Central Railway Club by favoring us with their presence. No ordinary collection of individuals is quite complete without a certain number of the fair sex present and those in authority in the early affairs of the Central Railway Club did well when they legislated so as to permit ladies to attend these annual club dinners. Women lead the Suffrage movement and often rule the household, so why should they not stand shoulder to shoulder with their husbands and sweethearts? That is the situation in regard to having the ladies here with us at these dinners. There is no argument. They are as essential as the Safety First movement. In fact, I would rather imply that it is a *verification* of the Safety First idea to have them here. There will be no dilly-dallying after the adjournment of the meeting. The men should go straight home and the women will see to it that they do, thus insuring the safety of all concerned.

A former speaker at one of these banquets told the story of the darky preacher, who, on coming before his congregation said—"Brothers and Sisters, I have a five dollar sermon and a two dollar sermon and a one dollar sermon. I am going to take up a collection and see which one this crowd is willing to pay for." And then he threatened that *this* crowd might get the dollar sermon.

Now I don't propose to preach much of a sermon, but I understand the President is expected to make a few serious remarks before turning the proceedings over to the Toastmaster to uncork the flow of wit and oratory, and as I am a poor hand at telling a funny story, I will invite your attention to the words of my text, which you will find in the second verse on the 23rd page of the 21st volume of our Official Proceedings,— "men who are known for their efficiency."

These are the words of the Prophet who has led this Club through the Wilderness during the past 40 weeks. In the passage from which

they are taken, he reflects on the list of prominent men who preceded him in office and wonders if he can worthily fulfill the duties which he is about to undertake. Among these predecessors were "men who are known for their efficiency."

Now, ladies and gentlemen, that last word has been much abused. We have had efficiency men and efficiency methods and we have had efficiency so dinged into our ears that we are all getting pretty sick of some of the stuff that is palmed off on us in the name of **efficiency**. To paraphrase the familiar quotation, "Oh Efficiency, **what crimes** have been committed in thy name!" A good **many** people confuse efficiency with some other quality. I had a long argument with one of my friends recently following a statement he had made that in his opinion, doctors as a class were very efficient. He claimed that doctors were a picked body of men. That they had their four years at college and their three or four additional years at the medical school, being weeded out in the meantime by examinations and tests of various kinds, until, when they had finished their training, they should be a select body of highly efficient men. I granted him all that and yet I maintained that doctors as a class were not more inefficient than the average men in almost any other profession or walk in life—my point being that the average efficiency in any occupation of the average man is not more than 20 per cent. or 25 per cent.

Now just what do I mean by that statement. In the first place, let us take a familiar illustration. We are all familiar with a steam boiler, and we say that its efficiency cannot be more than 70 or 75 per cent. We know that the coal we burn under the boiler contains a certain definite amount of energy. A pound of good coal may contain 14,500 heat units,—1 B. T. U. being the amount of heat required to raise the temperature of one pound of water 1° F. It takes 966 heat units to evaporate 1 pound of water so the 14,500 heat units in the pound of coal ought to evaporate 15 pounds of water. But some of the heat is lost up the chimney and some by radiation, so that when we test our boiler we find it has evaporated only about 10½ pounds of water per pound of coal instead of 15 pounds, and we say the efficiency is 70 per cent. Now it is fair to say that we never could get a commercial boiler which would not waste any heat up the chimney or by radiation, but we all know what we mean when we say that a boiler has an efficiency of 70 or 60 per cent. Likewise we know what is meant when we say that the efficiency of an alternating current transformer is 98 per cent.; of a turbine water wheel is 80 per cent. and of a steam engine is 10 per cent. And it is along these lines that I say that the efficiency of the average man is 25 per cent. I maintain that the track laborer is just as efficient in his job as the doctor is in his, not much more and not much less. The preacher, the lawyer, the machinist, the engineman, the clerk in the grocery store, the lawmaker in the legislature,—they are all about alike. Each in his job is more efficient or less efficient than the average of his class, for, of course, we do not expect the track laborer to know as much

as the enginemen, nor the grocery clerk as the statesman in Congress. And yet I sometimes think that the men in the humbler walks of life know more about their jobs and do better work in their line and are, therefore, more efficient than the men higher up. Here is an extract from an editorial in "Leslie's":

"I hope to see the day when people will resent the application of methods and theories to government which they would reject in their own business. Our difficulty seems to be that the fellows who run the government never had a business of their own to run, and couldn't run it now if they had it. Without experience, without property, without any possible danger or personal inconvenience or loss, they are cheerfully prescribing for the rest of us. Some day we will kick the whole tray of medicines into the ash can, and go out and get a breath of fresh air. After that we will get well quick."

Now why is it that we find the average efficiency so low? I am afraid it is because the average man does not want to know any more or do any more or think any more than he has to in order to hold his job. "Men who are known for their efficiency" are the ones who are promoted, and any of you men here who have been called upon to recommend one of your subordinates for promotion knows how hard it sometimes is to pick out the right man. So many men seem to be afraid to thrust their heads ever so little above the general level. And that is the thought I want to leave with you. Let us as members of the Central Railway Club be "men who are known for their efficiency." That is just the way and the only way that these predecessors of Mr. Jones were chosen as they were to fill the positions of trust and responsibility. Let us stand up and be counted! Let us work hard for the companies which employ us, and let every man here feel that the company he is working for is the best company there is and let him do his best to make it the most efficient railroad there is, even if it isn't the biggest, and let every one of us try to become in that company one of the "men who are known for their efficiency." "By their fruits ye shall know them."

And now in order that you shall not think I have been too hard on railroad men and supply men (who are almost always "men who are known for their efficiency," and who got their jobs because they *did* stick out head and shoulders above the general level, and who then found that they had graduated into a higher class and were further up the scale where more was expected of them and had to struggle harder than ever to beat that 25 per cent. efficiency) I trust you will pardon a personal digression and follow me for a moment into another field and see if you think I am far wrong in my estimate of 25 per cent.

In the February 21st number of a prominent weekly, I read an editorial on the matter which is now occupying the attention of the Interstate Commerce Commission. After acknowledging the impor-

tance of the railroad 5 per cent. rate increase, caution is urged in granting it. "If it is granted, it should be with conditions. The extensive development of American railroads has practically ceased. The demand is not for new railroads, but for larger terminals in already freightfully congested areas. Meanwhile one large means of freight transportation is under the present regime very nearly suppressed. We mean water transportation. This is, inland, about ten times cheaper than the best railroad performance. Are the railroads ready to stop this suppression and to make joint rates that will develop this traffic as highly as the railroad traffic has been developed? Present rates are undoubtedly too low in many directions. They are high enough in others. A horizontal increase is not intelligent. The revision of the rates along the lines of distant tariffs ought to be begun now. Will the railroads agree to this and assist in it? In other words, why should not the rate increase be a fair bargain between the railroads and the public, and in return for which the railroads will agree to certain things which are very difficult to reach by law, and which the average lawmaker but vaguely understands. The expenditure of one-tenth of the national income on freight transportation is certainly a matter of public interest.—"

Now two statements in that editorial attracted my attention and I wrote to the editor and stated my views. The text of the article leads one to infer that the average cost of inland water transportation is ten times cheaper than the best railroad performance in hauling freight, and I pointed out to the editor that while he might find one or two of the carriers on the Great Lakes whose operating costs were low enough to make his statement measurably correct, yet those operating costs did not take account of the maintenance of way costs which are provided for at public expense and every penny of such costs must be shown and accounted for by the rail carriers. They neglect the millions spent by governments, state and national, for harbor dredging, lock, canal and lighthouse construction and maintenance and overlook entirely the millions and millions which have been spent on improving waterways where the benefits to transportation would not even pay the interest on the investment. Furthermore I asked him to explain what he meant by the statement that one-tenth of the national income was spent for freight transportation. What is the national income? I know that roughly two billions of dollars out of the three billions they earn in this country is paid for freight transportation, but I don't know what the national income is. Well, here is the letter I got in reply:—

"Dear Sir:

With reference to yours of Feb. 18th as to inland water transportation being ten times cheaper than the corresponding railway construction:

A barge line is being built to carry coal from the Alabama coal mines down the Tombigbee and through a canal to New

Orleans, on which the coal cost for a five hundred mile voyage, for a thousand ton barge, is estimated at one dollar and fifty cents. The crew consists of two pilots, two firemen, a cook and two deck-hands. The return trip is made in a week.

You may find further details of this and other barge lines in recent numbers of the "Engineering News." I think that these facts amply justify my statement.

Believe me,

Very truly yours,

The Writer of the Paragraph."

"A barge line is being built," "the coal cost is estimated at one dollar and fifty cents." He thinks that these facts amply justify his statement! There wasn't a fact in his statement. What I would like to have said wasn't fit to print, so I wrote this letter:

"Dear Sir:

I have your letter, without date, signed with no name other than "The Writer of the Paragraph," in answer to mine of February 18th, concerning your remarks relative to Inland Water Transportation, etc. I am unwilling to express on paper what I feel concerning your attitude in this matter. Your editorial undoubtedly received wide circulation and reading, and many people appreciated as gospel what you put into type. I think my reading of the matter was intelligent and my letter to you has received no answer whatever. As I stated, the impression you conveyed was, the average cost of inland water transportation was ten times cheaper than the best railway performance, and you replied with no facts whatever, but referred to a barge line which is being built, and on certain expenses which are estimated make a meaningless statement that the coal cost for the 500 mile voyage, for a thousand ton barge, is to be \$1.50;—even with coal at \$1.00 a ton, this would pay for only 1½ tons of coal, which is ridiculous. I discounted your statement to a certain extent, which many of your readers would be unlikely to do; and my other question as to what you mean by "one-tenth of the National income," you have not referred to at all.

As you may not have retained a copy of your letter, I enclose the original, so that you may read it and then refer to the original statement and see how much of an answer you think it is for one who is honestly seeking information."

Then I received this answer:

"Dear Sir:

Your correspondence has been referred to me. I think your position is entirely correct. The paragraph in question

was not written by myself nor by any permanent member of the editorial staff. It was submitted by a man who is supposed to be an expert on railroad costs, the author of a book on theories of railroad valuation and other similar books. I accepted the facts as coming from an expert and printed them in that spirit. I am now satisfied they did not convey an accurate impression and I shall so state in an early issue of——.

"Have you any data yourself upon which could be based an accurate statement of the cost of water transportation compared with the cost of railroad transportation? I shall also try to get accurate data on this subject from other sources and as soon as I have, I shall, as I say, publish a correction.

Cordially yours,

(Sgd)"

That letter, I submit, ladies and gentlemen, is a fair answer, but I leave you to draw your own conclusion as to how far wrong I am in putting a 25 per cent. rating on the editor who handled that matter and it took the "bigga da boss" at that to get that little matter straightened out. And I also submit, ladies and gentlemen, that the man who prepared such stuff, the "man who is supposed to be an expert on railroad costs, the author of a book on theories of railroad valuation and other similar books" is quite a considerable distance below the 100 per cent. of perfection. God help the railroads if this is a sample of the men who write the books and mold public opinion if their statements and counsels are followed in the valuation of railroads.

Now I didn't intend to talk long, so I had better stop now and get to business. I dare say you feel about my talking like the desperado in Kentucky, who was about to be hanged. As usual the Sheriff gave him a chance to say a word before springing the trap. The fellow started by saying "I don't think I've got any remarks that—" when he was cut short by the loud cheerful voice of Joe Blackburn, who was then a candidate for U. S. Senator. "Say Bill, if you haven't got anything special to talk about, I wish you would give me about 15 minutes of your time just to let me say to these good people that I am a candidate for their suffrages and to show some reasons why, etc." "Hold on" said the desperado. "Sheriff, who is this man?" "That's Blackburn." "What Blackburn? Joe Blackburn?" "Yes." "I thought so. Give him my time; give him all of it. But go ahead and hang me first and make Blackburn talk afterward."

I dare say you are tired of hearing my voice, and as I am not running for office, and as Mr. MacBain is aching to give vent to his silver-tongued oratory, and I want to give you every chance to enjoy it, I shall forthwith subside. There being no official club business to transact at this time, and as we have men of eminence and renown here ready to speak to you, I beg to deliver the reins to the toastmaster of the

evening, Mr. MacBain, of the Lake Shore Railway, who will now assume the direction of affairs.

Ladies and gentlemen, I have the honor and satisfaction of presenting Mr. MacBain.

TOASTMASTER MACBAIN'S ADDRESS

Mr. President, Ladies and Gentlemen:

I am in a rather peculiar position tonight. It is by the purest accident that I am here and especially acting in the capacity of toastmaster. The whole thing reminds me of an experience that I once had in my actual railroad work. We had a steam shovel running in a pit up in Michigan, that was supposed to be run night and day.

We were in a great hurry getting out a little ballast, and at about 5:30 o'clock one evening I was informed that the night engineer had gone on a spree. We had all of our train crews around there and wanted to do twelve hours' work that night. One of the men working in the pit said to me, "That old fellow down in the ditch can run a shovel, I craned for him a good many years ago." So I went down to where the old chap was and talked with him a minute. I finally said, "Don't you think you could run that shovel, if I should trust you?" He scratched his head a moment and said, "I don't know whether I can run it or not but I'll try, and if I don't run it nobody else will."

I want to thank the club, in the first place, for conferring on me the honor of selecting me to act as toastmaster for the evening, and to say that it is always a great pleasure for me to attend the meetings of this club, because of the fine attendance, and especially because of the great number of ladies that come to these banquets. I am especially fond of Buffalo, having been around here for a great many years. Buffalo is the coldest place in the world climatically, and one of the warmest places in the world socially. Buffalo is also noted for its native intuition, and I do not believe there ever will be a better opportunity for having that exemplified than the present one. Now, if you notice, ladies and gentlemen, there is a large delegation here from New York tonight. Are they mixed around through the whole crowd? They are not. You find them all around one big table, all looking toward one another. Now why? Isn't it because Buffalo wouldn't trust them if they were scattered around throughout the house. (Laughter.) In further proof of the fact that Buffalo is canny in those things, I was advised but a few moments ago, by a gentleman representing the Erie Railroad, that the special will leave at 12:15. That will be shortly after the banquet closes; Buffalo will see that they are out of town before it sleeps. They are going over the Erie. (Laughter.) That Erie bunch can always be trusted to hang on to anything they once get hold of. (Laughter.)

Now, Mr. President, ladies and gentlemen, as I said before, this is entirely new business for me and in order that I may have an oppor-

tunity to regain my equilibrium—which is badly off just at the present moment—I am going to ask the meaning of the words on the bottom of the program or the toast list, "Recognition of reward and merit." I believe there is a gentleman sitting up here at the speakers' table who can explain that to us. I will call on Mr. Manchester.

MR. MANCHESTER INTERPRETS "RECOGNITION AND REWARD OF MERIT"

Mr. Toastmaster, Ladies and Gentlemen:

It affords me very great pleasure at this time to be permitted to have the opportunity of thanking and expressing our appreciation in the highest manner of our retiring president, Mr. W. F. Jones. We wish to thank him for the very high class of service rendered this Club during his incumbency in office. It is reflected in the highest financial standing of the Club today than ever before in its history. I have the honor, ladies and gentlemen, of being commissioned to present Mr. Jones with the emblem of past-president of this Club.

The careful work and attentive endeavors for the interests of this Club during your term of office, Mr. Jones, are much appreciated by us. The financial standing of our Club today is higher and in better condition than ever before, which speaks for itself as to your endeavors in its behalf. It gives me great pleasure to present to you, Mr. Jones, the past-master's badge—the past-president's badge. (Applause and laughter.) I trust that will be received and will always remind you of the many hard hours of labor made happy by cheerful associations and that the same will serve to you as an everlasting memory of your trials and labors for this Club during your incumbency in office. (Applause.)

RESPONSE OF PAST-PRESIDENT JONES

Mr. Manchester, Honorable Guests, Ladies and Gentlemen:

I want to thank you, Mr. Manchester, and through you the members of the Central Railway Club, for this emblem. To be a President of this Club is a high honor. There is a lot of pleasure connected with the presidency but it has its penalties and one of them is to make a speech when elected to the presidency; the second, to make a speech at the end of the term of office; and the third and the hardest, to endeavor to reply to the very kind words of the gentleman who presented this emblem. I want to tell you I'm nervous. (Laughter.) If any of you ever played Kelly Pool and had the "1" ball on the second shot you ought to know how I feel. I really feel worse than I do when I hold the "1" ball and get killed on the break. (Laughter.)

But laying all jokes aside, this is certainly a memorable night for me. I knew this was coming. I did not enjoy my dinner because I was trying to figure up something to say. I had a good speech all made up but I can't think of it. (Laughter.) I became a member of the Central Railway Club 12 years ago; took an active interest in it, in a

quiet way. Someone selected me for the executive board, later I was put in line for the highest office in the Club and finally was its President. I didn't work so hard. I made the other fellows work. And the result is that we have a prosperous club. There are lots of good fellows here and we are going to have some more good fellows here. The Club is going to grow until we reach the 1000 mark that has been set by the man who has succeeded me, Mr. Elmer. It is a lot of honor to be President of the Club and it is not a hard task to preside over a body of men but when it comes to making a speech, I tell you, gentlemen, it is a hard matter—especially before this intelligent audience.

I cannot fully appreciate just what this means to me tonight. I do not know fully what it means to my family. But in time, when I shall have thrown off the cares of a business career, sitting by the fire place, in the evening time of life, with my wife by my side and possibly grandchildren (laughter) and some friends surrounding me, it will be then that I shall take from the mantel this little emblem and I will think of my associates of the Central Railway Club. I will go back to the time of Macbeth, to the time of James, to the time of Hogan, Smith, Ball, Tewkesbury and the many men connected with the Club; and when I think of the good times that I had, the intellectual treats that were given by the Club, then will my measure of happiness be full and then I believe I can fully appreciate what is manifested in this emblem. Gentlemen, I thank you. (Applause.)

The TOASTMASTER—I just wish to pass a few more remarks regarding the people of Buffalo and the officers and members of this Club in general. You notice Secretary Vought, how busy he has been. He comes up here every few minutes and whispers across the table to the President that he has got another one—another one means another member: he has enrolled 51 tonight. I say fifty-one because he says he has more than fifty and I do not wish to exaggerate. Fifty-one new members for the Club tonight; that is certainly encouraging.

SECRETARY VOUGHT—Fifty-two, Mr. Toastmaster. (Applause.)

The TOASTMASTER—Now as the time is getting on it seems to me that we are about ready to start on something that is really good. (Laughter.) We have with us as one of the speakers of the evening a gentleman who has probably made a deeper and more thorough study into the matter of railroad organization than any other single individual in the United States. I have much pleasure in introducing Major Charles Hine.

ADDRESS OF MAJOR CHARLES HINE

Mr. Toastmaster, Ladies and Gentlemen, Men and Women of America:

I am proud to be a railroad man and not the least of the reasons is because the railroad men include the supply men—just as the minister

says "dearly beloved brethren"—because the brethren are supposed to embrace the sisters. (Laughter). All the gentlemen who have preceded me have spoken their fondness for the ladies. It is understood that the term "railroad man" includes the supply man. Not only are these able gentlemen purveyors to our needs but they have been most valuable allies in the contest against the common foe, ignorance of the needs of the railways, and through the Railway Business Association, headed by the superb Mr. Post—whom you will have the pleasure of hearing this evening—the Railway Business Association has done the railways of the country an incalculable service.

I am proud to be a railroad man because in peace time the railways are the best managed, the best administered undertaking in the ancient or modern world. I say in peace time because in war time individuals embody the aroused spirit of a people and rise to greater heights, are capable of more concentrated and more sustained effort. I believe in righteous war because the existence of all nations rests finally on the law of force. The nation is the agent of civilization. Patriotism is the highest expression of altruism, because in war time the individual not only yields his own opinion but sacrifices his own welfare and comfort for the good of his fellow-countrymen. Contrary to general opinion, modern wars result in increased wages and in increased opportunities for labor. Ruskin tells us that the art of a nation finds its highest expression when it has war for its inspiration, when it depicts the ideals of a people ready to die as individuals that their principles may live.

Seldom are the boundaries of a nation permanently fixed. To say that the United States of America shall never expand beyond its present more or less accidental boundaries is as absurd as to suppose that the railways entering the city of Buffalo should never build another mile of tributary line. Some nations, like some railways, cannot stand still; they must expand or disintegrate. Yes, war causes human suffering,—so does childbirth. Yes, war is dreadful,—but anarchy is intolerable. After so emphatic a declaration it would probably be no violation of confidence for anyone to say that I am an expansionist—what the irrev-erent call a jingo. But I do not go to the extreme of Americans who were dining in Paris at the close of the civil war. One man proposed the toast "Here's to the United States of America: bounded on the north by the Dominion of Canada, on the east by the Atlantic Ocean, etc. Another man rose and said that deeply as he deplored to delay the interesting part of the ceremony, the drinking of the toast, he could not subscribe to the sentiment until it should be amended, and he said, "I give you the United States of America: bounded on the north by the North Pole, on the east by the Atlantic Ocean, on the south by the South Pole and on the west by the Pacific Ocean." The third man rose and said it was very painful indeed further to delay the drinking but he must amend that toast. He said, "I give you the United States of America: bounded on the north by the aurora borealis, on the east by the procession of the equinoxes, on the south by the primeval chaos and on the west by the Day of Judgment." (Applause.)

I would hardly go so far. But the best practical example of patriotism that I have seen was in 1898. We were at Tampa, waiting to go to Cuba; we had rubbed elbows with all the generals and the famous people, the wealth and fashion had congregated there to see the departure of the army for Cuba, and as we were packing up in camp the colored hostler who was working around my tent mentioned our going to Cuba. He said, "When I left that livery stable in Washington to look after the officers' horses I thought I would go away for a little while, be in a military camp and enjoy myself and then go back to town, but," he said, "You all went out and established Camp Alger, you went to Chickamauga; here you are at Tampa; now you are going over to Cuba. If you let me I am going with you all." I said, "You want to be a little slow about that because, remember, you have no status. If any of us get disabled down there we get a pension, or if we get killed our families will get a pension, but you are a camp follower, there is nothing for you; and suppose, while you don't have to go on the firing line, you go down there and get the fever, what good will it do you?" He said, "It won't do me no good. There was a whole lot of them went to the last war and died and it didn't do them no good but it done the colored people some good and I'm going with you all." (Applause.) Germany, the foremost military nation of the world, is the most efficient industrially. Is this a happen-so, a meaningless coincidence?

Again refuting a popular but mistaken belief, the military type of organization is the most efficient. Military methods are most efficient because they insist upon that early convergence of authority which breeds an individual responsibility making for the highest efficiency. And, gentlemen, when I speak of military methods, military organization, I mean true military methods and true military organization; not acts of despotism, which are excrescences from the true organization, just as you find tyranny in industrial organization. I am speaking of the true spirit and the true application, not of sporadic departures that are exploited in the press and which may be over-featured in our imaginations. Military organization insists upon the preservation of the individual as the indivisible and indestructible unit of society and it insists on that early convergence of authority that makes for individual responsibility. It deplores passing it up to the other fellow and saying "that isn't my job"—a point which the president so well covered in his opening address. Organization is a branch of a larger subject, of sociology—the science of human nature. Organization seeks to emphasize the strong qualities of human nature and to minimize its amiable failures. A government establishes its organization through the constitution and imposes checks and balances against the unbalanced conduct of the different departments of government. It defines the scope of their authority. Remember that government is the largest of corporations, all the citizens being shareholders. A corporation adopts a chart of organization for the same general purposes—to define authority, to locate responsibility and to divide the undertaking into

logical and practical groups of workers. In the beginning such division is more or less self-suggesting. As the undertaking grows complications come from the very size of the proposition. The great problem then is to maintain efficiency as against the tendency of departments to overlap and conflict. So wonderful and so rapid has been the growth of the modern corporation that much of the inferior organization is a result of haphazard expedients rather than of scientific evolution.

As competition grows keener, as regulation becomes more restricted the margin of profit narrows and cheaper production must be brought about through more economical operation. These economics are sought through better organization and wiser administration. But right there remember that frequently what passes for good organization is poor organization offset by splendid administration. One of the amiable failings of human nature is that every man flatters himself that he is a born organizer. There are a thousand good administrators to one good organizer. And we are too prone to take the dictum of some successful man and say because he accomplished a certain result that the organization that he began should continue. Such type of man would get results with any organization. It is his strong personality. But the test of organization is whether or not it is self-perpetuating, as to how well it goes on after the particular individuals drop out who are there. Not that we are minimizing the efforts of personality, but we must have checks and balances which will insure a more or less efficient conduct of affairs whether a particular individual happens to drop out or die. It is becoming more and more realized that there are certain basic principles underlying activities that are seemingly unrelated. The letter carrier in gray has the same human qualities as the railway trainman in blue and is moved by the same actuating causes. We are probably about twenty per cent. unique and eighty per cent. common although we would prefer to believe that we were all about eighty per cent. unique and twenty per cent. common. True organization aims to minimize the effect of class consciousness. Class consciousness is out of place in a democracy and under a republican form of government. It can never be stamped out. But true composite efficiency demands that class consciousness shall be reduced to its lowest terms. So true organization endeavors to give the same consideration in the unorganized trackman that it gives to the superfluous member of the organized full train crew. (Applause.)

I tell you, as an old freight brakeman, that we do not need these extra men on these trains. (Applause.) It cost the Pennsylvania Railroad \$850,000 in the last fiscal year—five per cent. on \$17,000,000 of capital required—to haul an extra man over the road. The faulty organization of railways in too many semi-independent departments has made possible these economic wastes and these unreasonable exactions of the labor unions. It is unfair and unjust to blame the present labor union and the present labor leaders for these conditions. We of the so-called educated class, we the elder brothers of society and in-

dustry, have in this generation and the last failed somewhat in our duty. It has been so much easier to create a department and think it would run itself that the early managers yielded to that temptation of taking the line of least resistance. The easiest way is not always the best way and the line of least resistance is not always the safest. On the early railways the trackman became a brakeman and the brakeman perhaps a fireman but in every case a *company* man. Too soon there came these departments, the master mechanic unconsciously and honestly believing that the fireman in the mechanical department is a different kind of human being from the brakeman employed by the train-master in the transportation department—and in the long run the company pays the bill. Wherever specialization of function is allowed to run rampant we find departments created. Each specialist desires a department for himself, that he may be able to report to the big boss. This brings the point of convergence higher and higher and makes it more difficult to locate specific responsibility.

Gentlemen, we all believe in specialization, we all want the specialist, but where we differ is as to where true specialization ends and overspecialization begins. Each man feels that he has the correct solution. Remember that "*H* is always an extremist and *K* a radical but I am the happy medium." That is a God-given quality and it is a mighty good thing that we think that way. It would be a pretty sorry old world if we did not have confidence in ourselves. Now, where so many departments exist it results in there not being enough officials to go around. The management feel they can't pay so many officials salaries and so they fool themselves into believing that their supervision will in some way take care of itself. The result is that authority is delegated to chief clerks and to foremen. Now, do not misunderstand me as in any way deprecating the chief clerk. I am very proud to have been a chief clerk on the Big Four, very proud of it indeed, and I believe that there is no finer body of men in this country than the railway chief clerks, and I am not inveighing against them but I am inveighing against the vicious system under which they have to work. The most pernicious of all practices is permitting one man to sign the name of another. It is dishonest in conception and it is demoralizing in administration. You cannot by any process of reasoning say that you can destroy the individual and make one man out of a piece of two men. Is it honest to attempt to set up in fact that the Great-I-Am acted on this because his benevolent spirit is spread over the office when he is two or three hundred miles out on the road? And there we strike another amiable failure of human nature: practically every man flatters himself that he handles all the important matters himself and that his chief clerk never causes any friction with the offices below. The acid test is, "Well, old man, that is very fine. I congratulate you on having that happy condition. But would you mind telling me about the chief clerk of your boss?" Well, usually the man says, "Now, really—I—that is rather a delicate question, but you seem to be sincere in your inquiry and I

don't think you will embarrass me by any misconstruction or by repeating this where it might do me harm, but as a matter of fact the old man gives his chief clerk a great deal of latitude and I receive some letters that are somewhat embarrassing and occasionally humiliating." "Why don't you go to the old man and tell him, ask him to correct this?" "Well, he would probably tell me that I had better run my own office and that he felt capable of selecting the chief clerk without my assistance," which he probably would. He would think it if he didn't say it.

Now, gentlemen, it has been recently demonstrated that on sixteen hundred miles of railway that more efficient and more economical operation of the railway and the conduct of its affairs could be brought about by never permitting one man to sign the name of another; that includes all departments—executive, legal, operating, traffic, accounting, supply and purchase. When a letter came from that jurisdiction every man knew that the signature on it was what it purported to be—of the man himself. Now it is idle to say this cannot be done. It can be. It is a question of taste. Some men prefer the old method. They are responsible. That is for them to decide. But in the last analysis it is a question of taste. We say the old way is fine. I repeat the railways are admirably run. I believe they can be better run by more logical methods in such phases of the subject as this. If my fairy godmother would give me two wishes, one of them would be that no person should ever be permitted to sign the name of another. When I was a brakeman I learned that if I signed the name of my conductor to a train order we would probably both be fired and yet that train order was signed by the initials of a chief despatcher or the superintendent who might be entirely off the division and the letter which discharged us might be with the name of the superintendent signed by the chief clerk with his initials under the name. Now can you wonder that organized labor gets a little restive under such illogical treatment as that? You cannot quite make fish of one and fowl of the other. The other wish is that voiced by the President in the beginning: that every man should learn to do at least two things well and as many more as his opportunities and abilities might permit. Nations are stronger in the pioneer stage, when each man is trying to see how much he can do—he is not saying, "that is up to the other fellow"—when every man is willing to expend the greatest possible effort for the common weal. I thank the Club for its kind invitation and you all for your most polite attention. (Applause.)

AN UNEXPECTED "RAID" ON "CHARLIE" CASTLE

SECRETARY VOUGHT (from the rear of the hall)—Mr. Toastmaster, it becomes my unpleasant duty to say that we are confronted by the law and its representative, a stalwart "cop," who has invaded this place of peace and happiness. He informs me that he is advised that there is concealed within this room certain more or less disorderly persons from Gotham.

The TOASTMASTER—Didn't I tell you?

SECRETARY VOUGHT—I have tried my best, Mr. Toastmaster, to convince him that he is wrong. He says that he is well advised of the possibility of "rough house" indulgence and has been detailed for its suppression. I have no alternative but to ask your permission for him to do his duty, according to his orders, because he is a representative of the majesty of the law and we have no alternative but to submit. I take the liberty of bringing the gentleman forward. (The Secretary, amid roars of laughter, then escorted a policeman forward—Patrolman Quinland of the Franklin Street Station—in full uniform.) He says likewise that there is one man in this room who is responsible for all this disorderly crowd from New York. I have to show the patrolman to the table of Mr. Castle, at which he insists on sitting. (The officer, after dropping his club heavily on the table, then seated himself.) Thereupon led by the Apollo Quartette, the assemblage sang "For He's a Jolly Good Fellow."

The TOASTMASTER—What do you say for yourself, Mr. Castle?

MR. CASTLE—Mr. Toastmaster, Ladies and Gentleman, I don't know why this (the uniformed policeman) has been wished on me. I will admit that I was chairman of the committee of the train coming out from New York; I had to go away and I couldn't be there and all that. But it seems to me that that train was a very good train. Now of course, if it wasn't—you know—I'm going to wish you (the policeman) onto Craig—(laughter) this is Craig, to your right—Mr. MacBain and my esteemed old friend, Colonel George (Mr. Post) over there, the President of the greatest railroad supply and greatest railroad organization in the world. I didn't do this. This was wished on me. Now there's another fellow must be arrested. I'll take you up here and arrest him.

The TOASTMASTER—Mr. Officer, I believe you better stay right where you are. I announced early in the evening that it would be very necessary for every person to keep his eye on this large table in the center of the hall. I think it wise and judicious on the part of the Secretary in bringing you in and seating you where you are.

MR. CASTLE—All right then. I'll hang onto the club. (Laughter.)

The TOASTMASTER—We'll now have a song by the quartette. (Singing.)

The TOASTMASTER—Continuing our program, I find, ladies and gentlemen, that the next speaker is a representative of the law. It keeps me busy keeping away from the law and trying to find out what

the law means. The greatest trouble that any railroad man has nowadays is to be sure that he is going along straight and keeping clear of the law. About the best elucidation of the law that I ever heard was related in a little talk between an old Southern attorney and his colored servant who had been accused by one of the attorney's neighbors of stealing chickens. The old gentleman sent for Sam and said; "Sam, you good-for-nothing old nigger, do you know what the law does to chicken thieves?" Sam's reply was, "All depends on who gets the chickens, Massa." (Laughter.) With this little story I am going to introduce as the next speaker Mr. Samuel B. Botsford, Attorney, of this city, who will now address you.

ADDRESS OF MR. SAMUEL B. BOTSFORD

Mr. Toastmaster, Ladies and Gentlemen:

The attitude of the railroads toward the law is well shown this evening. So far as I know, I am the only representative of law and order seated at this table, and the railroads have placed two representatives of the United States regular army (referring to Major Hine and Major Bandholtz) between me and them. (Laughter.)

I had a short talk with the President as to what I should speak about. It is a very difficult thing for me to say anything to you that would be of value to you or would be of any special worth coming from me. I am not here this evening to attempt to get into your minds any great, deep philosophical truths; I am not here to do what Justice Pound referred to the other night as attempting to "unscrew the inscrutable." (Laughter.) I feel a deep personal acquaintance with all of you, but I never knew until this evening just why that was. When I first started practicing law, there was a case in the office that involved a claim for a carload of coal that had gone astray and apparently had been upon almost every line in Western New York. I started in corresponding and have preserved for many years the series of envelopes containing what I supposed were the signatures of all the department heads of all the railroads in Western New York, but I now find that they were simply the signatures of the chief clerks of the department heads. (Laughter.)

Major Hine's little story regarding the toast over in Paris about the great extent of the United States reminded me of a story which applies somewhat to the seeming distrust which the Buffalo railroad men have tonight for their brethren from Hell's Gate and from a little inside of Hell's Gate. (Laughter.) An Englishman was bragging about his country and he said that the sun never set on English soil, and some fellow remarked that the reason was that the Almighty didn't dare trust Englishmen in the dark. (Laughter.)

Now, I was a little embarrassed this evening when I sat down and saw the numerous initials which you men are given—"S. M. P." and "V. P." and "G. M." and other things. It made me think of the farmer

who went into a hotel and formed the third in line at the hotel register. The first in line, a clerical looking gentleman, signed his name "John Smith, D. D.," and the next fellow signed his name "George Brown, Ph. D.," so the farmer, not to be outdone, went up and signed his name "James Todd, R. F. D." (Laughter.)

While I have been sitting here this evening, at a safe distance, I tried to write out what seems to be in these days the popular definition of a railroad and as near as I can get it into language, the popular definition, judging from the statutes and the things that you see set on our law books regarding railroads, would be about as follows: A railroad is a continuous "Steal," operated by burglars, running between fences and connecting two or more sources of plunder. (Laughter.) As a matter of fact, it is possible that if the railroads do anything of that kind, it is simply living up to the name of their work. I had to appear once before the Transportation Club of Buffalo and on that occasion, I explained to them that the word *transportation* comes from the good old Latin word *trans-across*—and *porto*—to carry, to put—meaning to *put across*. (Laughter.)

Your President told me that I was to speak for the city of Buffalo, which is very easy, because everybody nowadays gets up and says that he represents all of the electors in the city of Buffalo, and I can probably do it with as good a claim that I represent the voters as a great many other fellows who talk prior to the day of election. Your President said he wanted me to welcome you to the city of Buffalo, or something of that kind. Of course, I welcome you to the city of Buffalo. What else can I do? About a generation or more ago, some fellow having far more authority than I have, gave you the freedom of this city, and ever since then you have had it. I welcome you to what little we have left, however. (Laughter.) I welcome you particularly to our railroad terminals (laughter), to our water-front, and to our viaducts, covered with bonds issued for *permanent* improvements. I welcome you to the Electric City—lighted by gas. (Laughter.)

We have, however, the same problems in all walks of life, that the railroad men have, and our problems, which seem to be different, are really quite similar. We are living in an age when the statute books are filled with all manner of the most inconsistent laws. There is a tremendous amount of tinkering going on. The people who should be leaders in this country are not leading. Colleges, as a matter of fact, generally teach the art of criticism rather than facts, and the result is that a great many well-meaning college graduates are leading reforms aimed at men who are better than the reformers themselves. The pursuit of riches is usually a narrowing task, and the result is that many of our wealthiest and most prominent men are engaged in leading movements which, if carried on, would not be for the public good. So the public is greatly confused,—there is such a multitude of counselors, all with the credentials of wisdom, all saying that they have the only true solution. The most modern feature of this condition of affairs takes

the form of committees. A committee is usually composed of one man who does all the work, and two or more men who rarely meet with that well informed fellow. Murderers are committed to death, and it looks sometimes as though our civilization would be *committed* to death. (Laughter.) The amount of ignorance which our public officials have to listen to from committees of prominent and well-meaning citizens is simply appalling. The corporations have the same trouble. If boards of directors of corporations were as conscientious and as thorough and efficient as the managers they employ, a great deal of the criticism of the corporations that now goes on would never have arisen. It is a very easy thing to sit in a soft chair and look wise, but some poor fellow must sweat out the real problems of management. This word *efficiency* that has been referred to so much this evening is really, I suppose, composed of two words,—*if* and *fish*, and these two words would amount to very little if there were not some poor struggling worm down there at the end of the hook. (Laughter.)

Now, I have no great message to give you. As I said, we are all up against the same problem. The Legislature of this State issues two or more good sized volumes of statutes each year, which all lawyers dutifully pay for, sometimes read and very rarely understand. (Laughter.) The next year, we will get several volumes, similar on the outside and very different on the inside. I feel, however, that I belong here. I remember that about two and a half years ago, I, with a client, had to meet one of the leading railroad men of this city, to discuss rates, and we put before him our proposition, told him what we wanted, how we wanted to ship, the quantities, and all the facts as well as we could, and when we had finished, we asked him what the rate would be, and he said, "Huh, I don't know. You lawyers are running our railroads now." (Laughter.)

As I said, I am not going to attempt anything whatever of a serious nature. I was puzzled as to what I should give you this afternoon and tried to think out something, and couldn't think of anything better for railroad men to hear than a little poem by Edmund Vance Cooke, who, I believe, is to appear in Buffalo tomorrow or next day. I have forgotten the title, but it runs as follows, and it applies to every man who is engaged in any serious work in this country to-day:

"Did you tackle that trouble that came your way
With a resolute heart and cheerful?
Or hide your face from the light of day
With a craven soul and fearful?
Oh, a trouble's a ton, or a trouble's an ounce,
Or a trouble is what you make it,
And it isn't the fact that you're hurt that counts,
But only how did you take it?

You are beaten to earth? Well, well, what's that?
Come up with a smiling face.
It's nothing against you to fall down flat,
But to lie there—that's disgrace.
The harder you're thrown, why the higher you bounce;
Be proud of your blackened eye.
It isn't the fact that you're licked that counts;
It's how did you fight—and why?

And though you be done to the death, what then?
 If you battled the best you could,
 If you played your part in the world of men,
 Why, the Critic will call it good.
 Death comes with a crawl, or comes with a pounce,
 And whether he's slow or sly,
 It isn't the fact that you're dead that counts,
 But only how did you die?"

The TOASTMASTER—I am sure, ladies and gentlemen, that we can take a great deal of comfort out of the remarks of the speakers who have spoken. A few days ago, Morris Brewster came into my office and slipped a little piece of paper on the desk and went right out. I reached over and got it, and it read something like this:

"When the whole world seems gone to pot
 And business is on the bum,
 A tilted chin and a two-cent grin
 Helps some, my boy, helps some!"

So cheer up, you railroad and supply men.

Now, ladies and gentlemen, we have another very eminent and well known gentleman with us who is going to take up the remainder of the time for speaking. I am sure that when he has concluded, this banquet will go down in history as having been the most successful banquet we have ever had. I now introduce to you, the Hon. George A. Post, who will address you in his ever pleasing and forceful way.

Mr. POST—Mr. President, Mr. Toastmaster, Ladies and Gentlemen of the Central Railway Club: I am very happy that it is my good fortune to work under Mr. MacBain in his first night of service as a general manager. I understand that he was summoned to this duty very unexpectedly and under emergent circumstances; but as he has always done, in every position that he has ever held before, he has made good, and I have no doubt that it is not far in the future when he will receive a summons from somewhere to become a real railroad general manager. (Applause.) It will afford me very great pleasure if it shall be my good fortune to sit in at some function which shall be organized for the purpose of wishing him success in a wider sphere of usefulness. I have listened with delight to the report that the Central Railway Club, as it comes to the end of its current year, is now in a more prosperous condition than ever before, with a larger membership and a greater degree of enthusiasm among all its members. This has only been accomplished by hard work and by everyone connected with it bending to the work with enthusiasm. I was very glad to see the honor shown to your retiring president, Brother Jones, under whose guidance all this year's work has been done, and I also noted the modesty of Mr. Jones, who so willingly and so cheerfully and so rightly shared the honors you would bestow on him with you who made it possible for this administration to be so brilliant a success. (Applause.) It is certainly a very distinguished honor to be the president of a live railway club and a man may well look forward to a time when, in retrospect, he can look

back—as Jones is going to look back when he has grandchildren on his knee (laughter)—and think that he participated in the work of a club which is doing and has done so much splendid work in the betterment of railway operations. To you, Mr. Elmer, successful as you have been in railway service, to the enjoyment and delight of your friends, I congratulate you that you have been placed upon the pedestal as president of the Central Railway Club. It speaks well for your zeal and for your efficiency and it speaks mighty well for the appreciation of the members of the Central Railway Club who know a good thing when they see it. (Applause.)

Now, perhaps, I owe you an apology for the nature of the address which I shall deliver in your presence tonight. Ordinarily when I am honored with an invitation to act as one of the jawsmiths on a festive occasion, I like to indulge in a little fun-making and hilarity and to conjure my brain for some thoughts which perhaps may appeal to the risibilities of the audience, and that was my expectation and my honest intention when I accepted your invitation. But to my amazement and my alarm, I got a little circular, issued by the Secretary of this institution, who said, that, upon this occasion, George Post would deliver a *special* address. Now what in thunder a *special* address is I don't know. (Laughter.) I have never delivered one that I know of, but I am going to try to make it appear that Harry knew what he was talking about. He has given me no clue as to what was expected. But that one designation of the character of my address drove all humorous thoughts from my brain and I settled down into a very serious frame of mind. So that when I shall have concluded my remarks, if there shall be gloom in the atmosphere, if there shall be disappointment, it is because this job that I am going to do is *special*. (Laughter.)

To speak in such a presence as this is an honor and a high privilege to any man. But it is an ordeal too. Of this I am deeply conscious at this moment. You are sitting here prepared to give me generously of that most precious possession of mankind, your time. You have fed me bountifully, you have received me graciously and now you are eager for me to give you that which is your due, a *quid pro quo* from me. I assure you that I most thoroughly enjoy just this kind of a party, where the women are with us. There have been some very nice and complimentary things said about the ladies tonight—earnest, and deserved—but somehow or other this evening is not complete on the lady business in the absence of our dear old friend Eugene Chamberlain. (Applause.) No man in any railroad club in the United States can hand out the beautiful, flowery, unctious oratory about the ladies that Eugene can. I don't know why he is not here tonight. I can imagine only one possible reason and that is that 'Gene must be working. (Laughter.) It has long been a theory of mine which has been put into practice in my own domestic establishment, that wives and husbands and all the family circle should turn the conversation as much as possible into a discussion or recital of things that are not only important to our own

selves but to all people and to the welfare of our nation as well. It is in that way that we find our greatest development and our broadest usefulness. If we are to have the wisest counsel of our women folks—and it is all-important that we should have—they should know what we are doing and what we are thinking, of which it is hoped that they may be the beneficiaries or from which they may possibly suffer. The narrower our range of subjects talked about, the smaller and more petty our domestic conversation, and we shrivel mentally. The bigger our themes of discourse, the bigger lives we live and the better citizens we are. There is no possible reason for the existence of such an organization as the Central Railway Club unless it be that its members desire to increase their efficiency to the companies with which they are connected and to encourage the interchange of views and ideas. When you find a man who does not desire to learn from others the things that they know, in exchange for a recital of some things that he knows, you have a mental miser: one who, adding nothing to his store of knowledge from the storehouses of knowledge of others, is soon passed in the race for supremacy and he settles down to be a grouch without any of the real joys of living. It is from such as he that the wailing chorus of the disgruntled is recruited, who cry aloud lustily but dismally for Equal Opportunity. As a matter of fact it is not Equal Opportunity that they want at all; what they want is Equal Results, no matter how miserable may be their own individual performance. (Applause.)

This is a very interesting occasion to me. It is interesting and decidedly pleasant because of the splendid company of people who are here assembled. In many of you I recognize warm friends of many years' standing, whose kindly greetings thrill me and to be with whom is always a great pleasure. But what constitutes the especially interesting feature of this function, is the fact that it was six years ago that I had the honor of being a speaker at a similar function of the Central Railway Club. Of course, those of you now present who were present then have forgotten what I talked about then and undoubtedly you tried to forget it as soon as you could. So had I forgotten it until my curiosity was piqued under this stress of "specialty" to see what I had talked about, and I found that the caption of my address at that time was "Who Are the Bosses?" Having been favored by the Secretary with a copy of the proceedings of the January meeting in 1908 I have re-read that discourse. It is the treatment of the subject chosen as my topic at that time that caused me to rub my eyes with wonderment at all the things that have happened since then and of the great change that has come over the face of the railway world since I last broke bread with you. At that time I occupied the attention of the audience by a more or less elaborate description of a list of men who were executives of railways and who, according to the lights that I then had, I was pleased to consider and name as the bosses of the railways. It was the main purpose of my discourse to prove that they had become bosses because they had served laboriously, faithfully, intelligently and con-

secutively in railway employ from their youth up to ripened manhood. I descanted at length upon the fact that they had sprung from humble surroundings and that as a preliminary to their after-acquired posts of distinction they themselves had undergone an extensive course of being bossed. I placed strong emphasis upon the statement that before they could have attained the positions of responsibility where sound judgment was the prime requirement, they had learned to say "No" when they ought to say so and "Yes" when it was the wise and proper thing to say it. I insisted then that to be the boss of a railway was a big job, requiring years of training, a thorough knowledge of the science of transportation, and that no man ought to expect to be a boss of a railway unless he had dug deep into the curriculum marked out for the study of those who would naturally be thought of for such a position.

Well, we are all six years older than we were then and in the light of what has transpired during those passing years, I am again disposed to dwell upon the inquiry I then made, only bringing it down to date: **WHO ARE THE BOSSES OF THE RAILWAYS IN THIS YEAR OF OUR LORD NINETEEN HUNDRED AND FOURTEEN?**

I am not going to give you tonight any biographical sketches of railway presidents—there are only a few hundred of them anyhow, big and small. Besides, they are not the bosses any more. They still retain the titular designation of president and under their corporate by-laws they are ostensibly clothed with power. As a matter of fact their duties are now mostly those of subordinates of the Government and they are trying mighty hard to see if they can get money enough wherewith to operate the railroads. In spending it they have very little to say. The point I make is this: that when a person has ceased to have the right to fix the price of the commodity or the service which he furnishes or the compensation which he shall pay to the man who does the work for him, he certainly cannot be said to be the boss of the situation. The bosses of the American railways today are really too numerous to mention in an after-dinner speech, for I would have to call the roll of all the voting population of the country and add to that a list of all the women in the country who have not yet attained the elective franchise—which is coming their way mighty fast—but who, even while they are waiting for it to come, can at least make themselves felt and heard. In order that the millions of railway bosses may not all be called upon all the time to attend to the multifarious details of bossing, there are quite a number of representative bosses who do keep busy continuously. Among them I would name the President of the United States and the thousands of his official retinue, including all the Interstate Commerce Commission with its imposing staff of employees: 48 State governors; 96 United States Senators; 435 congressmen; 157 State railway commissioners; 1700 State senators and 5500 State assemblymen. I have not named nor have I the time to name anywhere near all the lesser bosses who participate actively in telling railway officials what they must and what they shall not do. It is an interesting fact that most

of the foregoing enumerated railway bosses have become really active and, I might say aggressively dominating, in railway affairs since the last time that I attended a dinner of the Central Railway Club in Buffalo. It was about that time, if you remember, that *teeth* were put into railway regulation, as those responsible for legislation were pleased to describe their enactments.

Quite a change, is it not? Why was the change made? It was because the public became dissatisfied with the way that the old bosses conducted the railways. It is not necessary to recount or to recite the counts in the indictment against the old bosses for my thought is running in another channel entirely. For the purpose of this address it may be conceded that railway management was not all that it ought to have been. Concede that the change of bosses was made in the hope and with the high intention that the public should be better served, and concede, too, that many wrongs have been righted and that many needed reforms have been inaugurated.—I am in a generous frame of mind, you will see; I do not wish to grumble because there is a new order of things or a new set of bosses. I am not a reactionary; I am sincerely glad of all the good things that have happened; but I am not sure that all that has happened has been for the ultimate good of the public or of the railways either.

I am here to maintain, and that vigorously, that under the old bosses there were many mighty projects for the upbuilding of our nation that were brought to brilliant realization. I am here to assert that the wrongs perpetrated by the old bosses were small in comparison with the great big deeds of beneficence to our people that they performed. But, because some of them sinned, all have been denuded of their power and the dignity of their office has been minimized. Now to hark back to my viewpoint of six years ago—and to which I still adhere with tenacity—to boss our railways wisely, successfully and to the joint advantage of their owners and of the public, whoso undertakes to do the bossing must possess not *less* but *more* of brains, experience, foresight and willingness to assiduously apply every faculty to the proper service of the railways than did the bosses who have been dethroned. If we are to have more and better railways under the new regime than under the old, the new bosses must learn to say "Yes" when it ought to be said and "No" when a straight negative is needed. It will not do to always say "Yes" when the proposition is to spend the railroad's money and to always say "No" when the proposition is to allow them to earn enough money to conduct the railroad's business and properly serve the public. (Applause.) To boss property owned by others is a serious undertaking. Under the old way of handling our railroads, with whatever faults attached thereto, the bosses could be bounced at once if they were unsatisfactory. Under the new way, however, the bosses are the people—and who is going to bounce the people if they go wrong? Nobody. Nothing can save the railroads from un wisdom and neglect except that those new bosses shall fit themselves to be skilled railway administrators

whose judgment is to be as dependable as those who used to boss the job. It takes a man many, many years to reach the eminence of being a railway manager and more years for him to become a president. It constitutes a life of arduous work. How long does it take to transform a private citizen, who never had anything to do with a railroad, into a railway commissioner with omnipotent power over the railroads? Only so long as it takes the federal or State executive to sign the commission. The average official life of a legislator is not more than three years, probably less. The average term of service of our State railway commissioners does not exceed five years, generally less. A governor who serves four years is the exception. From this estimate it can be seen at a glance how casual an incident in a man's lifetime is his possible official connection with our railways. And we all know that as soon as a man's term of office expires all of his enthusiasm wanes and his study stops. Something, my friends, has got to be done to insure the longest possible service for those who may be appointed to our railway regulatory bodies. Seats upon that all-important bench—the Interstate Commerce Commission) must be made specially attractive to men of profound attainments and superb equipment for the exercise of the plenary power with which they are clothed by law. The emoluments ought to be made satisfactory to the minds of men who only ought to be considered therefor. So far as health and age will permit a man once chosen for that duty should remain there, with no lure of more lucrative place to distract his attention, but to settle down, knowing that he is earning enough to provide for the necessities of those depending upon him, with an eagerness to write his name large in the annals of government and assured that he will have the opportunity to do it. An interstate commerce commission or a State railway commission—frequently shifting its personnel—cannot do the job as it ought to be done. The reappointment of Commissioners Clark, Harlan and Clements cannot be too highly commended, because they have certainly grown stronger and more efficient with each year of their service. The prospective retirement of Commissioner Prouty is to be deplored by all who base their hopes of wise regulation of our railways upon the efficiency of the regulators. In the State of New York the emoluments of the office of public utilities commissioner have been fixed at an apparently satisfactory figure, but, sad to say, there has been shown no disposition as yet on the part of the appointing power to retain the services of those who have served a full term upon either the up-State or the metropolitan commission. What is a five-year term to a man who must during that brief period just fairly get started into the depths of the science of transportation if he shall not have a sense of official security? He might better, for the welfare of the State and of the railroads, never undertake the work at all. If he needed the money that the office pays, he certainly never ought to have been appointed under any circumstances whatever. Under the present trend of political thought which

selects legislators by direct primaries, it is certain that the average of legislative service will be shortened rather than lengthened. Hence it is of the utmost importance that legislative bodies shall not try to legislate in detail about railway matters, about which they can possibly know comparatively little, but content themselves with giving general instructions to expert bodies created for continuous service. There never was a truer saying than that too many cooks spoil the broth. There is another maxim that has some application also to the railway situation which is to the effect that "what is everybody's business is nobody's business." If all the people of our land are bent upon bossing the railroads—and they have certainly assumed the power to do so—then all the people must strive to know more about the way that railroads ought to be conducted. They must apply themselves seriously to a study of what is necessary to constitute a prosperous railroad; they must know and realize the necessity of a railway surplus. If the corner grocer and the shipper of merchandise think that they favor the fixing of railway freight rates by popular vote or clamor it might be well for them to carefully consider what might happen to them if the prices of what they sell were fixed by a vote of their customers, and after thinking it over they might strike a happy medium in the method of regulating "big business," as they call it, while retaining perfect freedom to do as they like about their own little business.

I am especially proud to have been a railway supply man during the last six years and I thank the distinguished railway official (Mr. Hine) who has paid so high a compliment to the craft to which I belong. In the fall of 1908 the railway supply men of the country awoke to the fact that in the changed order of economic conditions our relations with the railways needed readjustment. It dawned upon us that not only our own welfare but the welfare of the railways, from whom we derived our sustenance, had need of an entirely new viewpoint from us and a co-operation of which we had never dreamed. It became manifest to us that it was not enough that we should ply the railroads for their patronage, but that we should exercise the influence possessed by us in our home towns and among our wide acquaintance, where and with whom we enjoyed substantial social and business status, to get the public to view the railways with a deeper appreciation of what their welfare means to our country. We therefore organized the Railway Business Association. Prior to its birth the railway supply men were not especially friendly toward the railroads. I mean by that, solicitous of their welfare, as a comprehensive proposition. We did not then understand as we do now that about the only time that we were heard from was when we wanted something from them and we wanted it all at once and lots of it. I am afraid too that it was true that we were not showing any great concern about the general welfare of the railways. It was fortunate indeed that the day came when we awoke and saw that there was something else for us to do besides getting money out of railway treasuries. It dawned upon us that somebody must make it their

business to have a care for the filling of the treasuries and the husbanding of their resources. The years of the existence of our association have been years of earnest work, broadening view, genuine co-operation and constantly increasing appreciation of the burdens that are carried by railway managers. Ours has certainly been an entrancing work. We have been thrilled by the conviction that what we were doing was well worth while. There is an intense satisfaction to any man when he feels that he is doing something that is not alone for his selfish interest but which is for the common welfare of all. We have constantly and systematically studied railway needs, railway practices, governmental policies and public opinion. It has been a large part of the labor of the railway business association to patiently, persistently and thoroughly disseminate facts upon all phases of the railway problem that seem to be misunderstood. Shippers now more generally appreciate that service is more important than rates and that a railway company instead of being an inexhaustible barrel of money is a business enterprise whose expenses nearly equal and sometimes exceed its receipts and which can only provide adequate facilities if its net earnings place it in a position to do so. The necessity for maintenance of high railway credit has been the burden of our constant exhortation to the public. In various ways business men are manifesting now their willingness to consider without prejudice the plea of the railroads that their financial necessities demand careful consideration by the Interstate Commerce Commission, by the State railway commissions and by legislators, both State and federal. And we are glad to believe that we have been helpful in some measure at least in bringing about this change of thought on the part of the public. We have given of our time and energies without stint. There has been expended in our propaganda many, many thousands of dollars, not one penny of which has been contributed by the railroads or expended for any other purpose than for spreading in a legitimate way, in the open, arguments which we hoped would be persuasive to the public mind. We have had no lobbyists in our employ; we have had no enemies that we desired to destroy, but hither and yon we have gone upon our mission of conciliation. We wish those who are now the bosses of our railroads the greatest possible success. We hope that under their guidance our railroads shall make the same great strides they did make under the old regime; we would not inveigh against them but we are anxious to help them—and God knows, they need it. (Applause.)

The TOASTMASTER—Ladies and gentlemen, I just wish to say that I think you all must feel as I do,—that the evening has been a splendid one. We have listened to some splendid addresses on the part of the speakers, and I think we should all feel much better and happier and more cheerful than when we came in this evening. I wish to compliment the club and its officers—though I am an officer of the club but did nothing towards arranging for this beautiful banquet and

social affair—and I especially wish to compliment the entertainment committee who arranged so beautifully and bountifully for our comfort this evening, and before we adjourn I am going to suggest that we all rise and sing Auld Lang Syne.

After the singing the banquet was brought to a close.

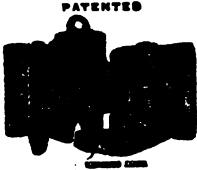
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Vol. 22

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No. 3

Central Railway Club

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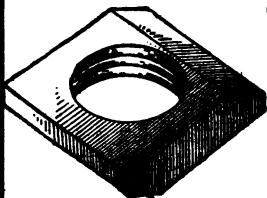
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NEXT MEETING, FRIDAY, SEPTEMBER 11, 1914

The May Meeting

The regular meeting of the Central Railway Club was held at the Hotel Statler, Buffalo, N. Y., Friday, May 8, 1914, at 8:30 P. M., with Mr. William Elmer, President, in the chair.

Those who registered as in attendance were:

Berg, A.	Garvin, H. L.	MacFarland, G. E.
Baach, F. Paul	Goltra, W. F.	Nace, R. R.
Carliss, Thomas E.	Gibney, James W.	Neff, John
Corey, Bloss P.	Greenleaf, Wm.	Owens, Wm.
Cary, J. A.	Gould, J. O.	Pickard, F. C.
Case, I. H.	Hamilton, John	Pugh, John P.
Crone, A. E.	Hanson, G. L.	Shelby, C. K.
De Witt, Wm. E.	Hugarts, Geo. L.	Sitterly, W. H.
Dolph, J. R.	Harris, Elmer E.	Tewkesbury, E. M.
Devans, E. J.	Jones, W. F.	Thompson, C. J.
Edson, H. C.	Klapp, H.	Toughey, T. F.
Fritts, J. C.	Kinne, C. J.	Tuma, F.
Frankenberger, E.	Lanagan, W. E.	Ueblacker, E. J.
Fryer, H. H.	Mason, E. F.	Yardley, C. B., Jr.

The PRESIDENT—Gentlemen, the first order of business is the roll-call. The cards have been passed, and will be collected, so that we can dispense with the roll-call. The minutes of the meeting of March 12 have already been printed and distributed among the membership, so that we can dispense with the reading of the minutes. It is very unfortunate, with two such interesting papers, that tonight we have the smallest attendance which it has ever been my misfortune to see. We had hoped especially that the ladies would be with us tonight, but I must say I cannot blame them very much for not venturing out during such a severe storm as we are now having. The next order of business is the report of standing committees. Mr. Secretary-Treasurer, will you kindly give us the report of the Executive Committee?

The SECRETARY—Mr. President and gentlemen, at the meeting of the Executive Committee this afternoon the members of the committee were much gratified to learn that the Club has in the bank today

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the largest cash balance ever known in its history at the May meeting—nearly \$1,500. We have maintained our balance at the first of the year, which was \$1,025. We have made large expenditures; we had a magnificent annual dinner. Further gratification was afforded the committee by the fact that notwithstanding the elaborate character of the annual dinner and the entertainment you were afforded, Mr. Harris, and his associates of the entertainment committee, were able to report that they saved the better part of the \$300 appropriated for the occasion by the executive committee. That is without precedent. Pardon me if I say this testifies not only to the efficiency of the committee but to the thorough business-like manner in which they have always handled their affairs in conjunction with the president of the organization.

The committee had before them a large number of subjects recommended for future meetings of the Club and it is possible to give you assurance, on the strength of the recommendations made, both for subjects and authors to prepare the papers, that you will have a still higher class of papers hereafter, notwithstanding the merits of those you have had in the past. We have material on hand for two seasons, which is also without precedent in the history of the Club. It serves to emphasize the fact that not only is the Central Railway Club growing, advancing and proving itself entitled to a place among the best of the railroad clubs of this country, but it is doing a work which means much for its future. This ought to be an encouragement to every member of this Club to get out and busily engage in co-operation for increasing our numerical strength to 1000 members. The Club is steadily gaining and it is for you to see that we continue in that direction.

The committee also gave consideration to the annual outing which it is decided shall be held as usual next September; at the present time, however, it is not possible to indicate definitely just where it will be held and what the program will be. You may feel well assured that it will at least equal all previous occasions and if plans in contemplation can be carried out all past records will be broken. That is what we have been doing for some little time now, for the past two or three years—breaking records and good records at that.

The schedule for next season, which will in a sense be a continuation of a period that closes tonight, has been completed and the president will, before we adjourn, make an announcement for September and November that will undoubtedly be pleasing to you. We are able to say also that in January next—that is a long time ahead, but we take time by the forelock these days, with the present administration—you are to have, for the first time, an annual electrical night. The arrangements have been made through Mr. Connette, president of the International Railway Company, and are now in the hands of Mr. Dickson, vice-president of that company. They will have, as I understand it,

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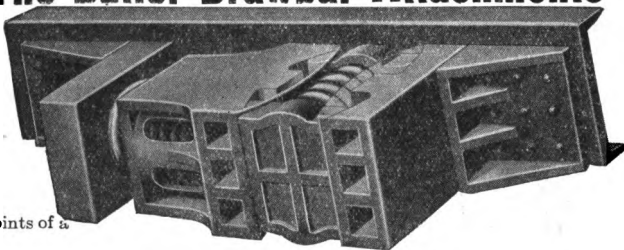
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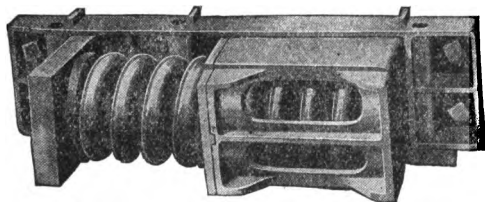
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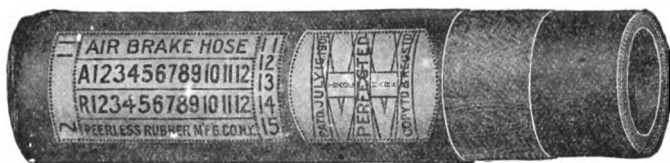
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The PRESIDENT—Gentlemen, this concludes the preliminary business session of the meeting and it is now with great pleasure that I introduce to you the speaker of the evening. We are all interested in the subject of railroad ties, being railroad men. Transportation is the function which engages our life work. The railroad cannot operate without a roadbed and the roadbed heretofore has been carried on ties. The subject of tie renewals is, as you know, one of the most expensive and important items that engage the attention of railway officers. There is a dearth of material, the forestry being used up, and some steps must be taken—have already been necessary—to preserve and conserve our supply of material. I am sure Mr. Goltra will be able to tell us something which we do not know, and it gives me great pleasure to present Mr. W. F. Goltra, president of the W. F. Goltra Tie Company, of Cleveland, who will tell us about treating railroad ties and timbers as practiced in America.

Mr. GOLTRA—Before I read my paper I desire to state that I feel highly complimented to have the privilege of addressing this prominent Club and wish to congratulate you on the splendid advancement it has made, both numerically and financially, according to your Secretary's report, which has just been made.

From the title of my paper you will observe that I will attempt to give you some information and facts regarding the practices in vogue in America for treating ties and timbers. It is not so many years ago when it was very difficult to secure any reliable information concerning these practices. Operators and practitioners, as a rule, were very reticent and were reluctant in enlightening the uninitiated. Some operators imagined that they alone possessed all of the "secrets" in timber

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treating and would not freely tell them to the outside world. Such information as could be obtained was often at variance with the truth and people would tell different stories. Some years ago I visited several treating plants in this country for the purpose of acquiring some knowledge as to the different methods of treating material. Being General Tie Agent of the New York Central Lines at the time, I was usually received with utmost courtesy. I was generally ushered in the plant and after being politely introduced to the foremen, was shown the roof, the treating cylinders and a few cars of treated ties and was given the "glad hand" and told to call again. (Laughter.) Only six or eight years ago if you visited a plant you would find the operator conducting his investigation in the utmost secrecy; in other words he thought he had the "world by the tail" and he would tell you one story. If you went to another plant, doing nothing different from what the other fellow was doing, although, he too, thought he had hold of that tail, he would tell you a different story. It was difficult for me to make the different stories fit and at last I asked one of these operators the following question. "How does it happen that you operators tell such different stories?" Replying with a smile, he said, "Well, Mr. Goltra, there is something about the smell of creosote oil that makes a man a liar." (Laughter.) This cleared up the whole field, although I did not believe it. I am glad to say, however, that the attitude of the operators and experts in the timber treating industry is fast changing. There is no reason, so far as I can see, for attempting to keep such methods in secrecy. There are no secrets connected with the proper treatment of timbers when you get down to a logical common sense business basis. There is plenty of room for all and the timber treating industry offers wonderful possibilities for expansion and improvement.

In this paper I will undertake to describe the different treating processes employed in America, in as few words as possible, and I trust you will bear with me while I read it.

"TREATING RAILROAD TIES AND TIMBERS AS PRACTISED IN AMERICA."

BY W. F. GOLTRA, PRESIDENT, W. F. GOLTRA TIE COMPANY
OF CLEVELAND

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The perishable nature of timber, especially when placed in situations where there is an excess of moisture in the surroundings, has led to many experiments, with the object in view of discovering a process of treating it with salts or oil, that would preserve it from decay.

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The time allotted to your speaker will admit of only a brief history of wood preservation in this country.

Before the advent of railways the treating of wood in America was primarily for use in construction of locks and canals. Small quantities of treated wood were used for structural and other purposes. The invention of the steam locomotive and railway gave rise to the necessity of protecting the wooden ties from decay. From this period may be reckoned the active progress in wood preservation. The treating of railway ties with a preservative of some kind increased rapidly and very soon the quantity of wood treated in the form of railway ties exceeded that used for all other purposes. This ratio is constantly increasing and at the present time about eighty per cent. of the wood treated in the United States consists of railway ties; the remaining twenty per cent. consists of piling, poles, paving blocks, construction timbers, etc.

The growth of the timber treating industry in the United States was slow at the beginning. During the period from 1856, when the Vermont Central erected a plant to treat ties with Chloride of Zinc, to 1885, when the Atchison, Topeka & Santa Fe Railroad erected a treating plant at Las Vegas, New Mexico, many experiments were made by various railroads. It is not to be supposed that every experiment made in the new field was a success. They were frequently dependent upon men without much prior experience in this line, and, who, to some extent were feeling their way. In the majority of the earlier trials, however, the results were favorable, and railway managers became convinced that much economy could be effected by treating railway ties and timbers.

Prior to 1885 there were only three pressure plants in existence. From that time on the number of plants constructed grew rapidly. At the close of the year 1890 there were eight plants; in 1895 twelve plants; in 1900 fifteen plants; in 1905 thirty-four plants; in 1910 seventy-four plants, and at the close of the year 1913 ninety-two plants in operation and two under construction. Thus the increase of the number of plants has been at the rate of about six a year. Not only has the number of plants greatly increased, but so has their treating capacity. At the close of the year 1903 there were twenty-seven plants in operation with an aggregate capacity of 21,350,000 ties per annum, or its equivalent in timber and other material, while at the end of the year 1913 the ninety-four plants had an aggregate capacity of 109,441,000 ties per annum. Thus, while the number of treating plants has quadrupled, their capacity has quintupled during the past decade. The total number of ties treated in the year 1885 was about 120,000, which was approximately one-fourth of one per cent. of the estimated number of ties used that year by all of the railways in the United States. The number treated annually increased amazingly, so that in the year 1913 36,250,000 ties received preservative treatment, being twenty-five per cent. of the entire number purchased by the steam and electric railways during that year. As above

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stated, there are 94 treating plants in the United States. As a rule, plants owned and operated by railroad companies treat for their lines exclusively and are not handling any commercial work of any kind for outside parties. There are 64 plants owned and operated by independent companies and 30 plants owned and operated by railroad companies.

Many Canadian railways are now beginning to realize the value of preserving at least a part of their tie material from decay and insect injury. The practice in Canada is just beginning, but it is increasing rapidly with the increasing cost of tie material and the constantly decreasing supply. In 1910 practically no treated ties were used by the Canadian railways. In 1911 some 206,000 ties received chemical treatment before being placed in the roadbed. This number while forming only 1.4 per cent. of the total number of ties used (14,289,224), was nevertheless, an indication of the increase in this particular form of conservation. In 1912, 1,818,189 cross ties were chemically treated. This number forms 8.5 per cent. of the total number (21,308,571) of ties laid during that year. It is very probable that the number of ties used during 1913 will be no less than 24,000,000 and at least ten per cent., or 2,400,000 of them will receive preservative treatment. At the close of the year 1913 there were five treating plants in operation in Canada.

The treated ties are mostly hardwoods, such as oaks, chestnut, beech, maple, birch and elm. The average cost of untreated ties in Canada laid during 1913, according to the Department of Forestry, is 48 cents each at point of production, and as this is nearly double the cost seventeen years ago, it has led to a largely increased use of chemically treated wood. There was doubt as to the economy of treating ties when they cost from 12 to 23 cents each, as was the case in 1897, but now that a way has been found to treat ties in a thorough manner, at an expense of about twenty-five cents per tie, which would lengthen the average life about six years and make available many species of wood that are unfit for cross ties without treatment, there is no longer any doubt as to the great economy effected by giving them a preservative treatment.

There are two general methods of impregnating woods with anti-septics, namely:

- (1) Impregnation by immersion in open tanks or boilers without pressure. This method is commonly known as the "open tank" or "non-pressure" process.
- (2) Impregnation by pneumatic pressure by means of force pumps and air-tight cylinders. This is commonly known as "pressure process."

The first method is the simplest and oldest form of applying the preservatives. As its name indicates, it consists in dipping or steeping the wood in open tanks filled with the preservative fluid. In some cases

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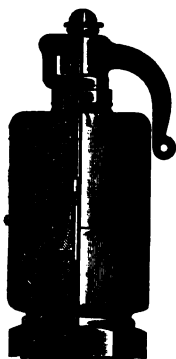
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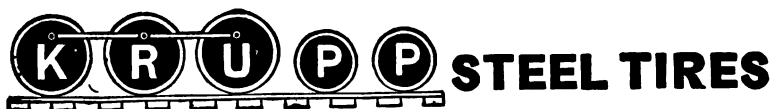
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the wood is boiled in the preservative. Again in other cases the wood is placed in closed cylinders and boiled, but no pressure is applied. It necessarily follows that this is an *absorption*, rather than an *injection* of the preserving fluid. It also follows that the depth of penetration obtained is very shallow, except for particularly open or porous woods, such as sap pine. However, it is only fair to say that some good results have been obtained by this method. "Kyanizing" is an open process, employing corrosive sublimate as the preservative, and the process is extensively and successfully used for impregnating telegraph poles in European countries. Manifestly it is a slow process compared with that by which the wood impregnated under pressure and is suitable for treating timber in comparatively small quantities. Although these are small affairs compared with the modern "pressure" plants, yet the aggregate quantity of material treated by this process is considerable. On the Pacific Coast there are three or four small iron open tanks in which butts of telegraph poles are boiled in creosote oil. In various parts of the country we find small open tanks, usually second-hand boilers or cylinders, with an opening cut along the upper side and a place to kindle fire underneath. In these fence posts and timbers are boiled in the preservative.

The second method of impregnation is the one in general use. In this method the timber is placed in cylinders with closed ends and the preservative is injected into the wood under pressure by the use of force pumps. There are some variations in the operation, but the principle is the same in all of them, namely, the injection of the fluid into the wood by application of pressure. The various methods or processes employed in America may be classed into five groups and described as follows:

PROCESS "A" (BETHEL—BURNETT—LOWRY)

Tiles, piling, timbers, poles, paving blocks, etc., are first air seasoned (that is, piled in open air for a period of three to twenty months), then run into cylinders and doors closed. The wood is then submerged in the preservative fluid, heated to a temperature of 170 to 190 degrees Fahr. before admission into the cylinders. Pressure pump is put into action, forcing more fluid into the cylinder. The operation is continued and maintained until the desired absorption is obtained. The pressure is then released, the surplus fluid drained from the cylinder and a vacuum is applied. This last operation is for the purpose of hastening the drying of the material. This completes the treating operation, and the material is then withdrawn from the cylinders. The above described method is known as the Bethell Process (Pat. 1838) when using creosote oil, Burnett Process (Pat. 1838) when using chloride of zinc or Lowry Process (Pat. 1906) using creosote oil.

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PROCESS "B" (PRELIMINARY STEAMING—VACUUM—PRESSURE)

Ties, piling, timbers, poles, paving blocks, etc., green or partially seasoned, are run into cylinders and doors closed. Live steam is admitted at such rate as to secure twenty pounds of steam pressure within thirty to fifty minutes. This pressure is maintained for periods varying from one to five hours, depending upon the character of the timber and its condition, but the pressure, as indicated on the gauge, should not exceed twenty pounds. A vacuum is then applied and maintained for at least one-half hour, at the expiration of which time the preservative is admitted into the cylinder without otherwise breaking the vacuum. The wood is then submerged in a preservative fluid, heated to a temperature of 170 to 190 degrees Fahr., before admission into the cylinder. Pressure pump is then put in action, and the remainder of the operation is the same as process "A" above described. This process is quite old and has no patent claimants.

PROCESS "C" (BOULTON—CURTIS AND ISAACS—BUEHLER)

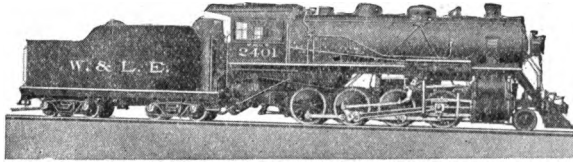
Ties, piling, timbers, poles, paving blocks, etc., green or partially seasoned, are run into a cylinder and door closed. The wood is submerged in a preservative fluid (usually creosote oil) and temperature raised to 215 to 225 degrees Fahr., and the boiling maintained for periods varying from four to eight hours, depending upon the character of the timber and its condition. A vacuum is sometimes applied to assist liberation of saps in the wood. Pressure pump is then put into action, and as the remainder of the operation is substantially the same process "A" above described. This method is called Boulton's Process (Pat. 1879), Curtis and Isaacs, (Pat. 1895) Buehler Process (Pat. 1908). This process is used extensively on the Pacific Coast for treatment of Douglas Fir.

PROCESS "D"—(RUEPING)

Ties, piling, timbers, poles, paving blocks, etc., are first air seasoned, then run into a cylinder and doors closed. An initial air pressure of varying intensity is applied, and without lowering this air pressure the cylinder is filled with a preservative (usually creosote oil) having a temperature of 170 to 190 degrees Fahr. Pressure pump is then put into action and the pressure is raised still higher. The remainder of the operation is substantially the same as in process "A," above described. This method is known as the Rueping Process (Pat. 1902 and reissued in 1907). The patentees call it an "Empty cell" process.

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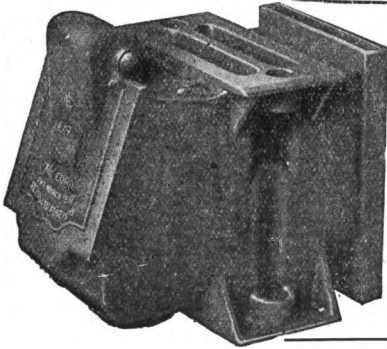
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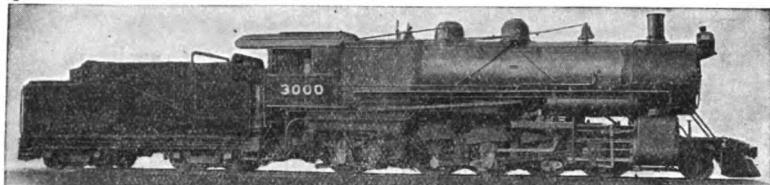
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PROCESS "E"—(CARD)

Creosote oil and zinc chloride (a water solution) have different specific gravities, and therefore separate from each other unless kept in agitation. When it is desirable to use a mixture of these two preservatives for the treatment of wood, it is necessary to keep the solution in agitation in the treating cylinder while it is being forced into the wood. A device for this purpose has been invented and patented by Mr. Card. The emulsion of zinc chloride and creosote oil is made and forced into the wood in one operation. This is known as the Card Process (Pat. 1906).

Practically all plants in America are equipped to treat by process "A" (Bethell—Burnett process) which is the earliest and simplest method of treating timber by application of pressure. Thirty-one plants are equipped to treat by process "B" (preliminary steaming—vacuum—pressure), while thirteen plants are equipped to treat by process "C" (boiling in creosote oil process). As boiling in creosote oil performs the same functions as steaming, no equipment is required to perform the latter. Of the remaining fifty plants, perhaps one-third to one-half are equipped in some crude fashion to steam material whenever occasion demands. Broadly speaking, about three-fourths of the treating plants in America are more or less completely equipped for steaming material prior to impregnation. Seventeen plants are equipped for treating by process "D" (Rueping Process) and nine by process "E" (Card Process).

SPECIES OF WOOD TREATED

The varieties of woods treated are numerous and dependent to a large extent upon the kind of timber available in the locality of the treating plant. The principal species are as follows.

NORTHERN FORESTS. Jack Pine, Spruce, Balsam, Fir, Birch, Hemlock, Beech, Chestnut, Ash and Tamarack.

CENTRAL FORESTS. White, Black and Red Oaks, Hickory, Chestnut, Poplar, Cherry, Elm, Maple, Beech, Black Gum, Sycamore and Butternut.

SOUTHERN FORESTS. Long Leaf and Short Leaf Yellow Pine, Loblolly Pine, White, Black and Red Oaks, Hickory, Black Gum, Red Gum, Elm and Cypress.

ROCKY MOUNTAIN FORESTS. Yellow Pine, Spruce, Cottonwood, Douglas Fir, Oaks, Balsam Fir and Aspens.

PACIFIC COAST FOREST. Douglas Fir, Western Red Cedar, Yellow Pines, Balsam Fir, Spruce, Hemlock, Maples, Birch, Redwood, Larch and Cedars.

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KIND OF MATERIAL TREATED

The principal kinds of material treated in this country are as follows:

Railroad Ties, Piling, Telegraph Poles, Dimensions Timbers, Switch Ties, Cross Arms, Mine Props, Fence Posts, Paving Blocks, Wooden Pipe, Crossing Plank, Signal Poles and Tie Plugs.

KIND OF PRESERVATIVES USED

Creosote oil and chloride of zinc, or combinations of these antiseptics are the principal preservatives used. Crude oil, corrosive sublimate, aluminum sulphate and carbolineum are other preservatives which have been used in smaller quantities. During the year 1913 100,000,000 gallons of creosote oil and 25,000,000 pounds of zinc chloride salts were used in treatment of wood by the treating plants in the United States. Foreign creosote is imported, chiefly from England and Germany, and constitutes about 70 per cent. of the consumption of this commodity in the United States. The bulk of the zinc chloride is produced by large manufacturers of this chemical in the United States and very little is imported.

Many problems in the art of treating wood with antiseptics have yet to be solved, and there is undoubtedly much room for improvement. Many years of experience, exhaustive study and close observation of the methods employed in timber treating, both in this and foreign countries, persuades the speaker to say that the greatest improvements in the present methods employed lie in the direction of a speedier and more efficient method of seasoning ties and timbers, a more thorough preparation of the same for receiving the injection of the antiseptic and a greater economy in the handling of the material in process of treatment, by means of modern equipment and appliances.

A majority of the timber treating plants in this country are treating ties and timbers by the same method and in the same manner as was practiced nearly half a century ago. This consists of simply placing the timber to be treated in air tight cylinders, frequently in unfit condition for treatment, and submerging the wood in a preservative fluid and then forcing more liquid into the wood by means of force pumps. Some modifications of this primitive method have been tried and recommended and some improvement has been accomplished, but it has been slow, because in a majority of cases the experimenters and practitioners confined themselves closely to the methods invented by Sir William Burnett and Mr. John Bethell of England, in 1838, and any departure from these two established methods is made with diffidence.

The industry of wood preserving is certain to expand as soon as the more or less experimental period is passed. In using the word "experimental" it is not meant that there is any doubt as to financial results,

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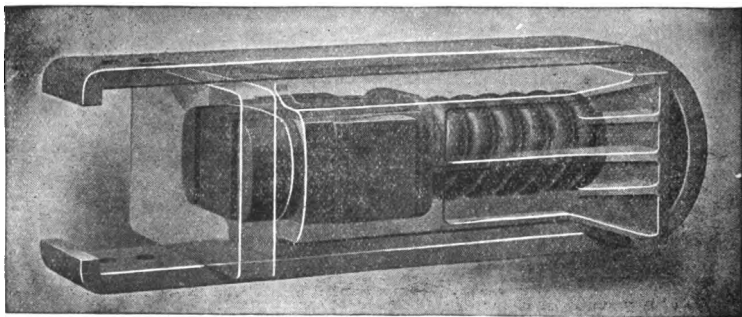
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but there is doubt as to what woods ought to be treated; as to what preservative treatment should be given; the effect of climatic and other conditions; cost of different preservatives delivered at the plant; manner of seasoning and preparing for treatment; supply and price of timber; amount and weight of traffic over a given line; the use or non-use of tie-plates; weight of rail; etc. They are all very important factors in determining the advisability of a preservative treatment.

Your speaker therefore earnestly recommends to the members of this Club the study and practice of timber preservation, both as an economic proposition and as a check on the rapid depletion of our forests.

The PRESIDENT—This very interesting paper is now before you, gentlemen. I trust that some of our friends from the maintenance-of-way department, who are familiar with the use of ties, are with us tonight and can give us some of their personal experiences in the use of treated material and the advantages of it over untreated material.

I made a few notes while Mr. Goltra was reading his paper and while some of the rest of the members are making up their minds as to what they are going to say I want to ask Mr. Goltra a question or two. Some years ago, on the Pittsburgh Division, we had to rebuild a roundhouse and we had shortly before that completed a treating plant for our timber and it was decided by the powers-that-be in the M. W. department who had charge of the construction of the buildings that the material entering into the construction of that roundhouse should be treated. We were a long while getting the material and when it finally came there was a great difference of opinion on the part of our local division people as to whether creosoted material was a proper thing to put into a roundhouse. The general consensus of opinion was of course that the wood would be preserved and that it would be desirable from that point of view to have treated material; but, on the other hand, it was considered that a very decided fire risk would be incurred if the creosoted material was put in. So after debating the subject for a long while the creosoted material was put in. Fortunately we have not had any fire. But I want to ask Mr. Goltra whether in his opinion it is wise to treat the lumber in use in the construction of roundhouses by a creosote process and whether in his opinion the fire risk is of sufficient importance so that we might better face the earlier renewal of material rather than run the risk of fire? I have also heard the discussion as to whether it would pay to treat ties that are put in the track under very heavy traffic. Undoubtedly our ties are shortened in life on a railroad which handles, say, fifty to seventy-five million tons of freight a year as compared with some railroad or branch of the same where perhaps eight or ten million tons per year are handled. There must be some line where the ties are worn out before they would be destroyed by the action of the elements, rot, etc. Possibly it would interest us if Mr. Goltra had a figure in his mind that he could name as to when it would pay not to treat the ties in the heavy-traffic territory? I also had occasion not long ago to look for some in-

formation on creosote and I was astonished to see the same figures that Mr. Goltra quotes—that about 70 per cent. of the creosote material used in this country is imported. I believe the larger proportion of it comes from Germany. Creosote is a material which has a most wonderful chemical constitution. Its symbol is beyond my memory; I won't try to name it. But I have often wondered why it was that so much more creosote is produced in Germany than in this country with its tremendous resources and large business industries, because it certainly must cost a good deal to bring that material across the ocean and distribute it overland to the various tie-treating points throughout the United States. Mr. Fritts, have you anything that you can add to the discussion?

MR. FRITTS—Mr. President, I had in mind to let some of the roadway department members have something to say on this subject. The treating of timber in freight cars I do not believe would be a paying proposition. And then we are very fast going to steel anyhow. But here is something, Mr. President, I had in mind and to which I have been giving some thought; in fact, it is the question that brought me to this meeting, as much as anything tonight: We have a lot of trouble with longitudinal sills decaying in milk cars. I was wondering if the creosote oils would affect the milk in a case of that kind? I would like to ask Mr. Goltra if he believes that it would be a safe proposition to put a creosoted sill in a milk car?

MR. GOLTRA—I am not sure that it would be prudent to treat car sills with creosote oil, I would be afraid to sanction it before making some experiments. As you know, we cannot load any ties that are treated with creosote oil in box cars.

MR. FRITTS—I know that.

MR. GOLTRA—As you know, it ruins certain kinds of freight that may be afterwards loaded in them. It is possible that the evaporation of the creosote oil in the sills might rise in the car and affect the milk or other contents.

MR. FRITTS—I have no doubt, Mr. President, from what little I know of this proposition, that there is money saved in treating railroad ties. The D. L. & W. has a large plant at East Paterson and I do not believe that our Company would be doing it if it were not a paying proposition.

MR. TEWKESBURY—The President suggested that a large percentage of the creosote was imported. I would like to ask the author of the paper if the creosote oil is a product of coal tar manufactured in this country?

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Mr. GOLTRA—Yes, sir.

Mr. TEWKESBURY—Then, Mr. President, would not that answer your question, to some extent, as to why the larger percentage of creosote used in this country is imported? The by-product of the coke ovens of this country which are to-day giving us most of the coal tar produced, is rather an innovation in this country of late years and undoubtedly has affected the supply of creosote oil. I think there are about half-a-million gallons of coal tar produced each month in the city of Buffalo at the present time, with the prospects of a material increase. Another question was raised by the president, as to the use of ties in tracks of heavy traffic as against those with light traffic. I think that is covered a little by the author of the paper in next to the last paragraph wherein he refers to the "amount and weight of traffic over a given line; the use or non-use of tie-plates; weight of rail, etc." The use of tie-plates, as I understand, is largely due to the present use of soft wood ties being necessary on account of the heavy traffic on a soft tie causing it to cut out very quickly. The weight of the rail would have, as I see it, very little to do with the use of preservation unless it hardens the wooden tie, which I believe is not the case. The width of the flange of the rail would have the effect of cutting, without the use of the tie-plate. I just mention those points, as Mr. Goltra will probably bring that up later in his rebuttal.

The PRESIDENT—Are there any other members present who would like to ask any questions of Mr. Goltra or make any further remarks? We have another paper this evening and we cannot unduly prolong this discussion.

Mr. MACFARLAND—Mr. President, I would like to ask what the effect of the preservative would be on the trunking or electrical work: as to whether creosote oil would affect the rubber used in the insulation of wires?

The PRESIDENT—Mr. Goltra will undoubtedly answer that question when he makes his final remarks. Are there any other questions, gentlemen? If not, will Mr. Goltra be kind enough to answer the questions that have been propounded?

Mr. GOLTRA—In regard to your question, Mr. President, relative to the advisability of treating timbers for roundhouses, I would hardly consider that necessary, because the timber is not subjected to alternate changes of the weather; it does not become wet and dry like railroad ties and is usually protected. Unless the timber in roundhouses comes in contact with the earth, where it would absorb moisture, I hardly think it would be necessary to treat it. It seems to me that all that is necessary to preserve the timber is to have air spaces around it, so far as

possible. Timbers in buildings with circulation of air about them, seldom decay.

In regard to your question concerning creosote oil, would state that seventy per cent. of it is imported from Germany and England, I suppose for the reason that it can be bought in those countries cheaper than it can be obtained in this country. Besides, the quantity of creosote oil manufactured in this country has not been equal to the increasing demand. The domestic supply is increasing at a good rate. We are using oils called "creosote" that are obtained from the distillation of other tars than coal tar. For example, a large proportion of the creosote oil manufactured in this country is made from petroleum tar and a relatively small quantity from wood tar. During the year 1903, there were only 7,700,000 gallons of creosote oil used in this country, about two-thirds of which was imported. At that time creosote oil was almost a drug on the market, but its great usefulness in treating ties and timbers became apparent and the quantity consumed has gradually increased year by year, until during the year 1913 the total consumption of creosote oil for treating ties and timbers in this country, amounted to 108,000,000 gallons.

In regard to the use of tie-plates, these are usually applied to soft woods, as stated by Mr. Tewkesbury. Some engineers prefer not to use tie plates if they can avoid it by using hardwood ties, such as red oak, beech, maple, sycamore and other hardwoods. A good many engineers apply tie plates to hardwood ties, as well as soft wood ties. In my opinion it is very necessary to apply tie plates to all soft wood ties, such as the pines, and in most instances would be economical to use them on hardwood ties.

As to the effect of the preservative on the trunking or electrical conduits for signal work, would state that so far as I know neither creosote oil nor chloride of zinc would have any deleterious effect or cause any trouble.

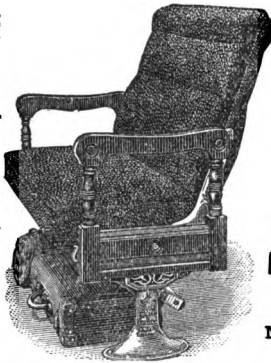
The PRESIDENT—I might just say, in clearing up perhaps a little misunderstanding in Mr. Goltra's mind, I do not know how familiar Mr. Goltra is with roundhouses but we cannot quite allow him to get away with the idea that a roundhouse is such a nice, dry spot as he evidently thinks it is. That is the reason I picked out roundhouses. I do not think any of us would recommend the use of creosoted timber in a building which was dry. If Mr. Goltra will think a minute I believe he will agree that when an engine, for instance, is blowing off steam in a roundhouse there is naturally a tremendous amount of moisture thrown up against some of the roof rafters and roof planking and when the engines are running in or backing out of the houses the exhaust is usually very wet and also there is a large quantity of water thrown into the air. So that the basis of the judgment on the part of our men perhaps was not so far wrong after all in that they did try to avoid that condition of alternate wetness and dryness which perhaps Mr. Goltra will now agree

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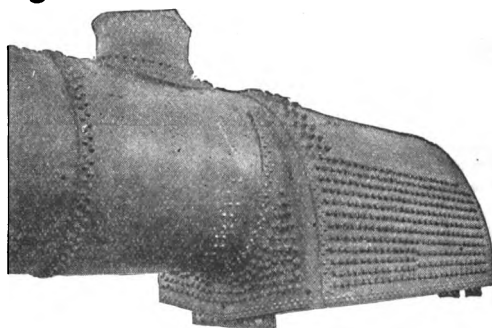
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is worth going after anywhere to prevent. Also Mr. Macfarland's question I do not think was quite understood. He asked whether the oil would have any effect on the insulation, whether the oil would attack the insulation on the wires which are enclosed in this trunking and would attack the material of which the insulation is made and perhaps destroy it. If there are no further remarks on that subject we will now proceed with the next, which is an illustrated lecture by one of the men in New York State who has had a very important part in carrying on the work of forest preservation. We have heard a great deal in recent years of the conservation of our natural resources. Mr. Goltra has shown the tremendous quantity of material that is being used for simply one industry. The forests of the State of New York have in times past supplied enormous quantities of ties and of course are being constantly used up for that work. And not only the uses which are made of the material but the accidents which happen to forests are a very interesting topic for our consideration. Therefore I am sure we will all enjoy listening to the illustrated lecture which will be given to us and I take pleasure in introducing now Mr. W. G. Howard, assistant superintendent of State forests in New York, who will talk on the subject of forestry and forest fire fighting in New York State.

"FORESTRY AND FOREST FIRE FIGHTING."

BY

WILLIAM G. HOWARD

ASSISTANT SUPERINTENDENT, STATE FORESTS, ALBANY, N. Y.

Forestry is a science which is comparatively new in the United States. When the first settlers came to this country they found forests in abundance. Their chief need was not to cultivate forests, but rather to open them up and clear them away in order to secure sufficient agricultural land to supply the needs of the community.

About forty years ago a few far-sighted individuals awoke to the fact that our forests were not inexhaustible; that some steps must be taken which would look toward their perpetuation in order that their final destruction and the lack of sufficient wood and pulp to supply the needs of the country might be avoided. Although forestry had then been practised in Europe for several hundred years, but few persons in this country were familiar with the subject.

A considerable impetus was given to the progress in the cause of forestry in this country by the active efforts of a few individuals, which culminated in the calling together of the American Forestry Congress in Cincinnati in 1882. Since that date progress has been exceedingly rapid in this country until we now have practically two hundred million acres of national forests and an organization under the federal government to administer the forests.

I am glad to say that the creation of a State Park Commission in New York State antedated about ten years the American Forestry Congress held in Cincinnati in 1882. The policy of acquiring lands for state forest preserve dates back to the creation of this Commission. The work has been going on ever since; land has been purchased by the state for the state forest preserve; an organization has been built up under the state government to protect this land and to further the advance of forestry in the state. Over a million and a half acres are now owned by the state in the Adirondack and Catskill regions. In this age it is probably hardly necessary to enlarge upon the value of forests to a state or nation. Through the wide publicity that the forestry movement has received in recent years nearly everyone has come to realize the salient features of the subject. We need forests on account of their influence on climate. It has been proved beyond question that large acres of woodland exert an equalizing effect upon the climate and tend to prevent extremely high or low temperatures. The influence of forests on stream flow has also been brought out, and I will show slides later on which will illustrate this more forcibly than anything which I could say.

The question of where we are going to secure our future supply of wood and timber has now become a serious one. Estimates have been made by foresters that at the present rate of cuttings the present supply of timber will be exhausted in twenty-five years; some have even put the time as short as twenty years.

We all realize the necessity for wood and timber. There is probably no material which enters more largely into our daily life. The increasing scarcity of lumber means higher prices. In order to prevent the rise of those prices we must secure an adequate supply of wood and timber.

Last, but by no means least, there is the influence of forests on the health of the people. Our Adirondack region attracts millions of people annually, who go to it to get a brief respite from the cramped conditions of city life. This region has an exceedingly large value as a health resort, especially for sufferers from tuberculosis. Its value to the state in that particular alone is so enormous that it would be hard to estimate in dollars and cents. The amount of timber taken out of the forests each year by lumbering and other agencies is extremely large. The average amount cut in New York State alone each year is not far from one billion feet board measure. This does not represent the total drain on the forest for the loss through fire, through insect depredation and through the damage done by tree diseases, which is probably as much again as that from lumbering.

The duty of protecting the forests of the state has been assigned by law to the Conservation Commission. This department is composed of three conservation commissioners appointed by the governor, and is divided into three divisions, namely, lands and forests, fish and game, and inland waters. The division of lands and forests, as its name implies, looks after the protection of the state forest preserve and the in-

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terests of forestry in the state. The work of the bureau may be considered under three heads, namely, protection, perpetuation and education.

The most important element from which the forest needs protection is fire; but, before going on to discuss the question of fire protection, it may be well to define the forest preserve. There are in all sixteen forest preserve counties, twelve, containing about 10,773,000 acres, in the Adirondack region, and four, containing 2,913,000 acres, in the Catskills, a total of 13,636,000 acres. There are, as I said, over a million and a half acres of this land owned by the state. In order to provide adequate protection of this area from fire and from trespass, it has been necessary to build up a rather extensive organization. A large force of men must necessarily be employed to patrol for fire and to see that no timber is stolen from the state land. The organization of this force is largely determined by law.

Within the forest preserve counties the towns in more densely forested portions are designated as "Fire Towns," and state fire protection is restricted to these towns, of which there are in all ninety-seven with a total acreage of 7,200,000 acres. Although the state does not concern itself with fire protection in the forest preserve outside of the fire towns, there is a section of the town law which provides that Supervisors shall act as ex-officio fire officers. There have been cases decided in court where the Supervisor of a town was held liable for damages incurred by fires which were suffered to escape on account of his neglect.

FOREST PRESERVES

The Forest Preserves are divided into five districts, four in the Adirondacks and one in the Catskills. An officer known as the District Forest Ranger is appointed for each district and has his headquarters at a suitable point within his district. He is paid a salary of \$1,500 a year and is allowed his necessary traveling expenses. The actual fire fighting force is made up of a number of men known as Forest Rangers who are paid by the State at the rate of \$60 per month and who devote all their time to the work. New York is one of the few states having its fire fighting force on a paid basis. The efficiency of the patrol force is greatly increased by a large number of mountain observation stations located on vantage points commanding views of large areas of forest land and connected by telephone with the headquarters of patrolmen and superintendents of fires.

Fire wardens are appointed to supplement the force of regular men. These specials are given the same powers in regard to warning out men and fighting fires as the regular forest rangers, but are only paid for the time they actually spend in fighting fires. They are paid at the rate of 25c. an hour. During the fire season, that is, from about May 1 to November 1, approximately 70 rangers are employed. These are distributed as follows: about 15 for each Adirondack district and 10 for the Catskills. There are now 50 mountain observation stations equipped,

43 in the Adirondack region and 7 in the Catskills. These observation stations have proved their value in the four seasons we have had them. Last year there were 366 fires reported by observation stations. The number of stations has been doubled within the past two years, and more are even now being planned. Some mountains in the Adirondacks are too high to be most effective as observation stations on account of the fact that they are obscured by clouds during a large part of the time. This is true of Whiteface Mountain which is the third highest peak in the Adirondacks and one of the first to be equipped as a station.

OBSERVATION STATIONS

Each station has an observer assigned to it. Some of the stations are so far from settlements that the observer is obliged to live on the mountain. We have built some log cabins and board shacks, and are also using tents in some instances. The camp is usually located within a half a mile or so of the summit of the mountain and near a spring whenever possible. Every mountain station has a telephone instrument in a shelter on the summit, and most of the camps have an extra instrument. Observers are equipped with topographic sheets mounted so as to show all the territory visible from the mountain top. An alidade is supplied with the map, and every man is given a pair of powerful field glasses.

When a fire is discovered by a mountain observer he calls up to the ranger who is nearest the fire. All the rangers are stationed where they can be readily reached by telephone. When he is notified of a fire the ranger goes to it at once, or as soon as he can gather together a crew of fire fighters. He is given authority by law to warn out men to help fight fire, and anyone who refuses to respond is liable to a fine of \$20. Each ranger has a quantity of tools, such as shovels, rakes, hoes, mattocks, pails, etc., at his headquarters, and tools are also stored at convenient places in different parts of each petrol district so as to be readily available in case of fire.

METHODS OF FIGHTING FIRES

The methods of fighting forest fires vary, of course, according to the different conditions. The large amount of duff and ground litter, often several feet thick, found in most parts of the Adirondacks, makes it difficult to surround a fire with a trench that will make it safe, if no water is obtainable. Fires often smoulder for weeks in this duff before they can be extinguished. One of our men has used dynamite to open up a fire line quickly and has found it most effective. Rangers are given strict instructions to have every fire watched until it is completely extinguished. When a patrolman has more than one fire in his district he appoints a foreman, or if there is none available a special fire warden

takes charge of each fire and he himself moves from one fire to another to see that the work is going on properly.

Fire wardens are directly responsible to the regular rangers and they in turn report to their District Rangers who are under the Assistant Superintendent of Forests. A complete report must be made out by the ranger for each fire in his district. This report states the cause of the fire, the acreage burned, the quality of land burned over, the amount of damage done, etc., and must accompany the payroll submitted by the ranger for the labor hired by him to fight fire. They are paid at the rate of fifteen cents per hour, with subsistence, if they are obliged to camp out or stay away from their homes. This may seem like poor pay for the arduous labor of fighting fires, but in 1908, under the old law, when the pay was twenty-five cents, it was found that fires were deliberately set by persons who wanted pay for fighting them.

STATE PAYS TOTAL EXPENSES

Under the present law, which went into effect in 1909, the State pays the total expense of fighting fires. At the end of the year the towns reimburse the state for one-half the expense incurred in hiring temporary men and getting them to the fire. The regular patrol force is, as I mentioned before, paid entirely by the State. Mr. Pinchot in a recent address said that New York State was most generous in her treatment of the lumbermen as regards fire protection, and he said New York was the only state he knew of in which a lumberman could put out his own men to fight fire on his own lands and be reimbursed for his expense. Our system has, however, proved successfully. Last year 100,000 acres per man were protected, and, although the season was unusually dry, especially in parts of the Adirondacks, where practically no rain fell for a period of over a month, the cost of protection, including all salaries and expenses, and fair per cent. of mountain cost, came to $1/10$ of 1 cent per acre, and only $1/2$ of 1 per cent. of the area protected was burned over. This year's record will be even better.

FIRES CAUSED BY RAILROADS

The railroads have for the past few years caused more fires than any other agency. The law now provides that locomotives shall be equipped with suitable and effective devices to prevent the escape of sparks from the stack, or of coals from the ash pans. We have six railroad fire inspectors to see that the provisions of the law are complied with. Furthermore, the Public Service Commission in 1908 issued an order compelling the use of oil-burning locomotives during the daytime on certain lines passing through the forest regions. Each railroad is obliged by law to keep its right-of-way cleared of all inflammable material such as weeds, brush, fallen timber, etc.

Clearing land has always been a prolific source of forest fires. The present law provides that no burning shall be done at any time of the year except under permit granted by a representative of the Conservation Department. We have materially reduced the danger of forest fires from this cause by strict enforcement of this law and the collection of considerable penalties from violators.

CARELESSNESS OF CAMPERS

Many fires are caused each year by the carelessness of campers, hunters and fishermen. We are trying to obviate these causes so far as possible by having the patrolmen post fire notices in conspicuous places along roads, trails and streams. Wherever possible the patrolmen talk with people going into the woods and caution them about fires.

Last year especially, lightning caused many fires, 65 fires from this cause being reported. Observation stations are invaluable for detecting these fires, since no one can know in advance where the danger lies, as in the case with railroad fires, or those caused by parties of campers.

One provision of the New York Fire Law is, I believe, unique. This is the section requiring that all lateral branches be lopped from the tops of coniferous trees cut for any purpose other than for use with the limbs on. In the winter following the terrible forest fires of 1908, Commissioner Whipple held a conference of the leading lumbermen of the State for the purpose of devising some manner of reducing the danger of fire on cut-over lands. Most of the lumbermen were in favor of the top-logging law. The cost of lopping is from 15 to 25 cents per thousand feet. Many lumbermen have said that the extra lumber taken out of the tops of the trees by the jobbers more than offset this expense; for since the branches have to be cut off anyway, the jobber has no reason to leave any merchantable timber in the top on account of the trouble of limbing.

TOP-LOPPING

The top-logging law has now been in force for three seasons, and we have learned that for the first two or three years after lumbering takes place, lopping the tops does little to reduce the fire danger. After that time, however, the lopped branches decay rapidly and within ten years the danger of fires starting on the cut-over land is reduced to a minimum. On the other hand, where tops have not been lopped, the branches are dry and have not begun to decay. These facts were proven beyond question by investigations carried on two years ago on a tract of land in the Adirondacks which was lumbered over about twelve years ago and where part of the tops were lopped and part were not. In addition to the more rapid decay of the lopped branches, it is much easier to fight fire on land where the side branches of the tops have been removed than where the old tops have been left untouched. In the latter case, making a fire line

entails much swamping and cutting of branches, while in the former the branches, if they are still unrotted, can be picked up and tossed to one side without the use of an axe.

NO TIMBER CUTTING

The protection of the 1,600,000 acres of State land within the Forest Preserve against trespass is one of the most important duties assigned the Superintendent of Forests. The problem of the administration of state land is made unusually difficult by the location of the different parcels. There are in all 6,770 separate parcels of land. Some of these, to be sure, are of large area and lie adjacent to each other, but others contain only a few acres situated at a considerable distance from the main-body of state land and are surrounded by private holdings. These outlying tracts have been acquired largely at tax sales: purchases of land have been confined to the Adirondack and Catskill Parks.

Section 7 of Article 7 of the State Constitution provides that: The lands of the State, now owned or hereafter acquired, constituting the forest preserve as now fixed by law, shall be forever kept as wild forest lands. They shall not be leased, sold or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed or destroyed.

This section of the Constitution, therefore, specifically prohibits the cutting of any timber on state land. It even prevents the opening up of roads or fire lines.

CAUSES OF TRESPASS

Our rangers are instructed to keep careful watch of all state land and to report immediately any trespass. The law provides a penalty of \$10 for each tree cut on state land. The causes of trespass are many. Some cases of wilful and deliberate violation of the law have been discovered. Sometimes a dispute as to the title to the land in question is involved. Again, when lumbering is going on on tracts adjacent to state land, the jobber in charge of the operation will, either through ignorance of the exact location of the line, or through carelessness, permit his men to cut over the line on the state.

Although we are prevented by the constitutional prohibition from lumbering on state land, there has been no obstruction placed in the progress of reforesting. In about ten years our state nurseries have been developed until they are amongst the best in this country. More than 6,000 acres of state land have been reforested.

Since 1908 the state nurseries have supplied trees at cost to private individuals wishing to reforest land within this state. The demand for trees has grown so rapidly that for the past two or three years there have been but few trees available for planting state land. On some species the demand from private individuals has exceeded the supply. The state now has approximately 40 acres in nurseries.

There is a number of state institutions throughout the state from eastern Long Island to the extreme western part of the state. Many of these are equipped with considerable areas of land suitable only for the practice of forestry. The law provides that the Conservation Commission shall examine these lands with a view to introducing scientific forest management. One of our foresters has made the necessary examination, and the governing boards of many of the institutions are carrying out the forester's recommendations, with the result that in a short time now we will carry out a practical working plan on these tracts which will serve as admirable demonstration forests.

Some time we hope to be able to utilize the timber which is being produced in the forest preserve. We have endeavored by education to show the people of the state the necessity of amending that section of the constitution which forbids this. It is quite evident that true forestry cannot be practised on these lands unless the cutting of timber is permitted.

The PRESIDENT—Ladies and gentlemen—I hear a few ladies have arrived in the meantime—we have certainly enjoyed this talk of Mr. Howard and I believe he will be glad to answer any questions if any of the members have anything they would like to ask. I am certain it is not out of a lack of desire to pay a compliment to Mr. Howard that no one feels called upon to make any remarks. I feel that Mr. Howard has covered the subject so thoroughly that there is nothing more to be said. He is the expert and we are the learners. I know we have had a great deal of pleasure in listening to this interesting and very beautifully illustrated lecture.

Mr. TEWKESBURY—Mr. President, this has certainly been a very enjoyable evening and we are not only greatly indebted to the first speaker for showing us how to preserve the wood but we are doubly indebted to the last speaker who showed the process of forestry, which is certainly new to me and I think to a great many others. Mr. Howard has made me homesick to-night. It has been my pleasure during the last few years to make an annual trip into the Adirondacks, both for fishing and hunting. Some of the views he has shown here tonight made me feel that when I decided last week that I could not go fishing this month that I am sorry I had to make such a decision. One thing that he brought out tonight in regard to the preservation of the forests was brought very forcibly to my attention the last time I was up there. I saw a very beautiful little evergreen that I wanted to pull up and bring home and put in my yard; it wasn't any more than about knee high; but I was told that if I pulled it up I was liable to go to jail. I was also admonished last fall when I was up there hunting, by one of the forest rangers, in regard to putting out the fire after a little luncheon that we had in the woods, but as we had a good guide with us who had served 25 years there the admonition was not necessary and as I am not a smoker,

why, I got out alive. As I stated we are very greatly indebted to these gentlemen for this very fine entertainment and as an expression of appreciation thereof I would move a vote of thanks to both of these men. I suggest a rising vote.

The PRESIDENT—It has been moved that the speakers who have so kindly entertained and instructed us be given a vote of thanks which shall be manifested by all those present rising. (The motion was unanimously adopted.) Mr. Goltra and Mr. Howard, you have given us a very pleasant evening and I am very glad to extend to you the vote of thanks which the Club has tendered. The Secretary has one or two announcements to make before we adjourn.

The SECRETARY—Mr. President and gentlemen, we have the following applications for membership:

Davis, Donald C.	Chief Draftsman, Gould Coupler Co., Buffalo, N. Y.
Elder, John R.	Conductor, B. R. & P. R. R., Salamanca, N. Y.
Gardner, Henry	Superintendent of Shops, B. & O., Baltimore, Md.
Howard, G.	Railroad Dep't., Fairbanks, Morse & Co., 30 Church St., New York City
Hall, F. E.	Sec.-Treas., Buffalo & Susquehanna R.R. Cor. 974 Ellicott Square, Buffalo, N. Y.
Humburch, R. S.	Assist. Mech. Engr., Merchants' Des. Trans. Co., East Rochester, N. Y.
Harris, A. J. B.	Mech. Engr., Merchants' Despatch Trans. Co., East Rochester, N. Y.
Rea, Samuel H.	V. P., Pressed Steel Mfg. Co., 90 West St., New York City
Waring, William	G. M. Engineering Co., 809 Morris Building, Philadelphia, Pa.
Wilson, R. D.	General Car Inspector, P. & R. R. R., Reading, Pa.

The SECRETARY—Permit me to say, Mr. President, it is especially gratifying that men who rank as mechanical engineers are coming into the Club. We want more of that element and we will get still more and better discussion when we have a subject like this pending. What we lack tonight is the attendance of men who are familiar with the subject.

The PRESIDENT—I just want to say in closing that we hope the speakers tonight, Mr. Goltra and Mr. Howard, will understand that it

was the condition of the weather which is responsible for our small attendance. When I left the house tonight to come down here it was raining very hard. And while I know the men who did not come out will now be sorry they were not here, we hope the gentlemen will understand that the weather is responsible and not a lack of interest. The program for the September session has been discussed and the paper will be presented by Mr. George Wagstaff on "Locomotive Arch Brick." We have also, as the Secretary-Treasurer has informed you, been discussing the subject of the entertainment at the September meeting and we will make the usual postal-card announcement when the matter has been decided upon. If there is no further business a motion is in order to adjourn.

On motion the meeting then adjourned.

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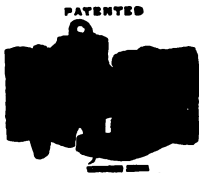
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Vol. 22

OFFICIAL PROCEEDINGS

No. 4

Central Railway Club

SEPTEMBER MEETING, 1914

PUBLISHED BY THE CLUB

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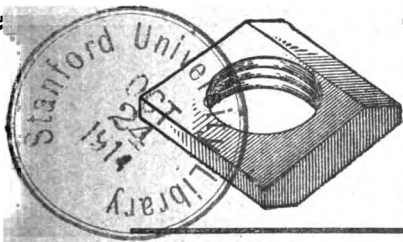
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MAY, SEPTEMBER AND NOVEMBER, AND SECOND THURSDAY
IN MARCH, AT 8 P. M.**

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NEXT MEETING, FRIDAY, NOVEMBER 13, 1914

The September Meeting

The regular meeting of the Central Railway Club was held at the Buffalo Launch Club, Grand Island, N. Y., Friday, September 11, 1914, at 4:30 P. M., the president, Mr. W. Elmer, in the chair.

Those who registered as in attendance were:

Anderson, J. B.	Dehnert, Paul	Hogan, C. H.
Anthony, Jas. T.	Devans, E. J.	Hopkirk, T. H.
Albers, L. H.	Dambrow, W. T.	Inger, E. P.
Arter, W. D.	Elmer, William	Jones, W. F.
Barnaby, Robt.	Ellis, Chas. W.	Johnson, L. T.
Biehl, John	Edson, H. C.	Kinney, W. J.
Bulger, James	Farrell, W. J.	Kennedy, Fred.
Bulger, H. S.	Ford, F. L.	Lawson, A.
Berg, H. V.	Fahy, W. J.	McCormick, C. H.
Brigham, H. R.	Fryer, H. H.	McCuen, C. F.
Burness, J. E.	Foster, F. J.	McDonell, J.
Bowman, Geo. A.	Gardner, G. C., Jr.	Morlock, H. F.
Boas, F. Paul	Gould, Amos	Mooney, W. D.
Buckbee, W. A.	Gould, J. O.	Martin, P. A.
Burton, Ed.	Garvin, H. L.	Mason, E. F.
Barker, J. I.	Goodenough, F. H.	Moore, John B.
Boa, Edward R.	Groom, Frank C.	Mischka, Edward F., Sr.
Charlton, Geo. J.	Ganson, F. C.	Maisel, W. J.
Conley, Albert	Gould, Amos	Murphy, M. J.
Clark, F. H.	Gross, E. G.	Myers, Timothy
Currie, J. C.	Gibney, James W.	Mooney, E. P.
Clendening, H. M.	Goodwin, J. T.	Murray, John J.
Caswell, H. C.	Hindman, S. M.	Oram, R. C.
Crone, A. E.	Herbim, Ed. J.	O'Connell, Wm. J.
Curay, Thomas	Hofner, G. N.	Owens, Wm.
Campbell, N. A.	Haley, E. J.	Piske, Fred. Jr.
Condit, John A.	Hilferty, C. D.	Parsons, J. E.
Coon, W. C.	Hasty, Jesse W.	Pickard, F. C.
Chamberlin, Henry M.	Heffron, J. J.	Pugh, John P.
Clare, Geo. C.	Holloway, J. R.	Prior, J. B.
Dahlke, Otto	Hassett, M. W.	Patterson, H. S.
Dodd, L. C.	Harris, Elmer E.	Reed, James

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Schrader, J. R.	Turner, W. C.	Whalen, F.
Savage, H. D.	Tate, M. K.	Wanamaker, W.
Schulte, Henry H.	Thompson, C. J.	Williamson, D. H.
Simmons, L. G.	Tewkesbury, E. M.	Weimert, Fred.
Stennert, Paul	Talty, John A.	Wheeler, Chas. W.
Sills, S. J.	Tuma, Frank	Whalen, Gerald
Smith, Pierce G.	Tunkey, Wm.	Whitehead, V. L.
Smith, John	Trout, H. S.	Waite, Geo. L.
Sergel, J. G.	Toughey, T. F.	Watson, Ross
Singer, James	Usherwood, Geo. B.	Yardley, C. B. Jr.

The PRESIDENT—Gentlemen, please come to order. On account of the use of the attendance cards it will not be necessary to call the roll; and as the minutes of the previous meeting have been printed and distributed among the members, we can dispense with the reading of the minutes.

I want to say before we get into the business part of the meeting that it is a great pleasure to be able to see so many of our members and friends with us today. On account of the serious financial and business difficulties, it is a decided compliment to the Club as a whole to have so many of the members out. I know that some of us have made considerable personal sacrifices in getting here. I also wish to personally extend my thanks for and express my appreciation of the very orderly and polite collection of gentlemen we have with us today. I think this meeting sets a very high mark for the meetings which we hope will follow, and I am sure that the gentlemen today, following the pleasure all of us have experienced, believe our annual outings are well worth while. I must say that next year, if my voice amounts to anything, I am going to vote for a little warmer day, but that is one thing we cannot always help.

There is an announcement I want to make of the committee to nominate candidates for officers for the ensuing year. I will appoint as such committee Mr. George A. Bowman, Assistant General Freight Agent of the Buffalo, Rochester & Pittsburgh; Mr. F. C. Pickard, Master Mechanic of the Lackawanna and Mr. J. C. Currie of the Nathan Manufacturing Company.

The next business is the report of standing committees. The first will be the report of the executive committee, by the Secretary-Treasurer.

The SECRETARY—Mr. President and gentlemen, the executive committee held a regular meeting on board the boat coming down the

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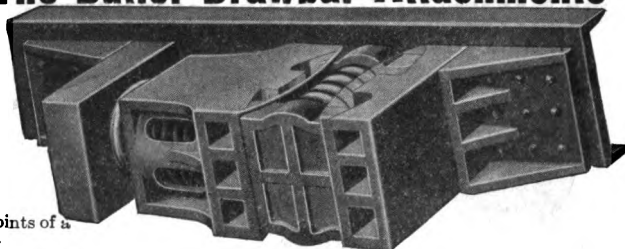
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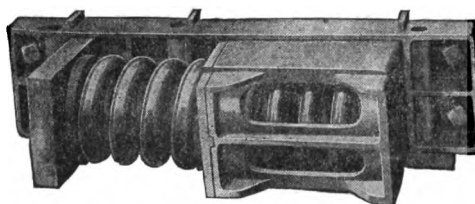
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river this morning. Probably one of the most gratifying statements they can make to the members of the Club is that we have the best balance in the bank ever reported at a September meeting of the Central Railway Club, nearly \$1,600. This is without precedent.

An invitation was accepted to hold our next meeting at the plant of the Hewett Rubber Company, and the arrangement is this: The members will assemble at the Hotel Statler at 2:30 P. M., and motor to the plant. On arrival there a tour of the works will be made, under the direction of Mr. Sill, the manager, at the termination of which supper will be served. This order has been arranged so that those who find it impossible or inconvenient to leave their duties during the earlier part of the day, can probably accomplish it and reach the works of the Hewett Rubber Company in time for the supper. At the close of the supper the regular meeting of the Club will be held and the feature of that occasion will be a paper which, we are advised, will deal with the painting and protection of steel car equipment.

Another gratifying fact, in the face of the business depression prevailing during the past year—and which may be said to testify not only to the standing and reputation of the Central Railway Club before the business world, but also a spirit of good will for the organization and its president and those who have co-operated with him—a number of business houses have, on application, given us new advertising contracts, which means a larger income in the future. We have other contracts promised when business is better.

The President has appointed as a committee to begin early preparations for our annual dinner next March, and arrange for speakers and a toastmaster, Mr. E. Chamberlin, Chairman; Mr. E. M. Tewkesbury, Mr. W. F. Jones and the Secretary.

The only unpleasant feature to report is the fact that about twenty eight members of the Club have forgotten their obligations and, though indulged by the executive committee up to this time, they have today been suspended from all rights and privileges for non-payment of dues for 1913. We still believe, however, that several whose names appear on the list have simply overlooked the fact that they are in arrears, and when the matter is brought to their attention by a special letter, will be glad to put themselves in good standing. When no greater number out of more than 700 members have failed in their duty to the Club, the situation is not discouraging; in fact, it is one of the best statements of this character that has ever been made.

The executive committee regrets to announce that since the last meeting they have been advised of the death of Mr. H. E. Brown, superintendent of the New York Central at Buffalo. Tribute to his memory was paid in the May Proceedings by the display of the customary Memorial page.

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The PRESIDENT—The next order of business is the presentation of the paper, which it was very kind of the author to prepare for us. It has been our misfortune in a number of these outing meetings to have only a very limited time for the presentation of the paper; and in conversation today we have practically decided that as long as the paper has been distributed it will be read in abstract only and the more important points touched on so as to leave as much time as possible available for the discussion. It therefore gives me great pleasure to introduce the author of the paper on "Locomotive Arch Brick," Mr. George Wagstaff of the American Arch Company of New York.

Mr. WAGSTAFF—Mr. President and Gentlemen of the Central Railway Club, I concur entirely with the suggestion of our President in regard to the importance of a discussion of this paper. Already requests have come to me personally for the Proceedings of this September meeting and a number of railroad men I know are looking for the discussion of this paper, as they already have the advance printed paper in their hands. So I hope the discussion on this subject will be such as will reflect due credit upon the Club.

"LOCOMOTIVE ARCH BRICK"

BY

MR. GEORGE WAGSTAFF OF THE AMERICAN ARCH COMPANY
NEW YORK CITY

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I am pleased to respond to the Central Railway Club's invitation to read a paper to them on the subject of "Locomotive Arch Brick."

So much has been said and written about brick arches, their design, application and advantages, and so little about the brick itself, that it occurs to me that while you are all familiar with the many good features of brick arches and the rapid progress they have made on railroads in the last few years, only a small proportion of you have had the time and opportunity to familiarize yourselves with the materials and manufacture of Locomotive Arch Brick. This paper refers to the manufacture of Security Arch Brick exclusively, as I am not familiar with the manufacture of any other kind.

First, we will start with the clays. Pure fire clay is a substance composed of silica and alumina, exclusively, but no deposits of clay of this purity have ever been discovered. All commercial clays contain in addition, iron, lime, magnesia and small quantities of other impurities.

Nature has been very economical in her distribution of high grade fire clays, the best known deposits being those in Pennsylvania, Maryland, New Jersey, Kentucky, Ohio, and the St. Louis districts. While,

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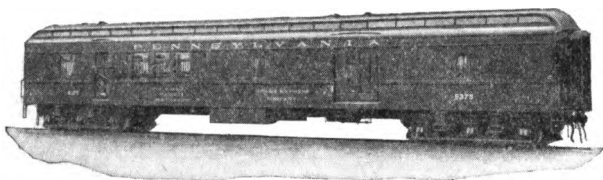
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of course, fire clays of a fairly good grade are found and are worked in many other sections of the United States, the clays in the districts named are recognized the world over as of the highest grade, and are adapted to more uses in the industrial arts than those of any other sections.

These clays are mined in various ways; some are mined with steam shovels; others, as those of the St. Louis district, by sinking a shaft into the ground; and those of Kentucky by driving under the hills. The veins are of varying thickness, but those of the drift are generally about eight feet high.

There are three varieties of clays used in the manufacture of arch brick:

No. 1, or flint clays.

No. 2, or plastic clays and calcined clays.

The flint clays are hard, as the name would indicate, and no amount of moisture or pressure can cause them to bond or to be held in a regular form.

The No. 2, or plastic clays, are what their name would indicate, a bonding clay, and contrary to general belief, good plastic clays will stand just as much heat as the flint clays.

Calcined clays are the flint clays which are taken from the mine and burned or calcined before being used. This is done for the purpose of driving off all the moisture and eliminating the shrinkage which enables the manufacturer to better regulate the shrinkage in his brick. All clays shrink during the drying and burning. The clays from the districts enumerated above shrink from three-quarters to an inch per foot, according to the nature of the clay. Good clean bats are very desirable for this purpose also.

After the clay is mined, it is taken into storage yard and allowed to lie in the weather from several weeks to several months, depending upon the financial condition of the concern handling clay, as it costs considerable money to carry 10,000 to 20,000 tons of clay in storage yards for any length of time.

This weathering causes the clay to disintegrate, and the alkalis are mostly washed away during this treatment. After it is weathered, it is carried to the grinding pans. These are large pans and about eight or nine feet in diameter, containing two large wheels or mullers six to twelve inches wide, about four feet in diameter and weighing about three and one-half tons. These revolve on the bottom of the pan. As the clay is ground under the mullers, it is thrown towards the outer rim next to which is a perforated plate through which the clay of proper fineness drops to scrapers on the bottom of the pan. These carry it to an elevator which in turn carries it to a storage bin.

No. 1 and No. 2 clays and the calcined are ground separately and conveyed to several bins; from there to properly proportioned measur-

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ing cars. A competent person must have charge of measuring cars, so that there is no chance of mixture varying. From the cars, the mixture is dumped into wet pans where it is tempered with water to proper consistency, then ground again under three and one-half ton rollers until ready to mold. Then shapes as required are made by competent molder experts in this business. Molds are made out of walnut or mahogany. After molding, they are carried to a drying floor and allowed to dry very slowly. The slower they are dried, the stronger the brick.

After brick has been dried thoroughly, it is carried to the kilns and there set in tiers. However, to get the best results and the hardest burned brick, they are set in certain locations of the kiln. The kilns are generally round, about 30 feet in diameter, and have from eight to twelve fire-holes, and hold from 60,000 to 80,000 brick. These kilns are closed and slowly fired, requiring about five days to bring a kiln to full fire, and then two to three days thereafter to complete the burn. A kiln must be brought to full fire slowly, for the reason that there is still quite a bit of moisture in the brick. If the fire is brought up too rapidly, steam will form in the center of the brick and burst it. After the kiln has been burned and after the burning is complete, the brick having reached a temperature of from 2200 to 2400 degrees, the kiln is left closed and cooled very slowly, which adds very materially to the quality of the product, as the slow cooling has a tendency to thoroughly anneal the brick.

As the bricks are taken from the kiln, they are carefully inspected. Any that show defects are thrown to the bat pile where they are ground up and used as calcined.

PROGRESS AND RECENT DEVELOPMENTS.

It is estimated that there are at present in the United States and Canada between 29,000 and 30,000 engines equipped with fire brick. Of this number, about 19,000 have tube supported arches, between 7,000 and 8,000 have stud supported arches, about 3,000 are oil burners, and about 127 have the Gaines combustion chamber. Of this latter, 74 are the straight wall type, and 53 are the locomotive furnace engines, or wall and Security Arch type.

The Gaines (Fig. 1) combustion chambers are developing nicely, 127 locomotives being in actual service and equipped with various designs of this device, reports to date being very encouraging. It looks as though this device has come to stay and will have a brilliant future.

The latest new feature of brick wall (Figs. 2 and 3) is not recommended to supplant arch tubes and sectional brick designs. There are a large number of locomotive fireboxes with very little throat depth at front end, and the bottom row of fire tubes are so close to the top of the grates that it is not practicable to apply arch tubes and arches. This

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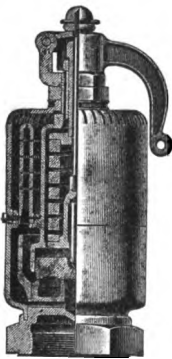
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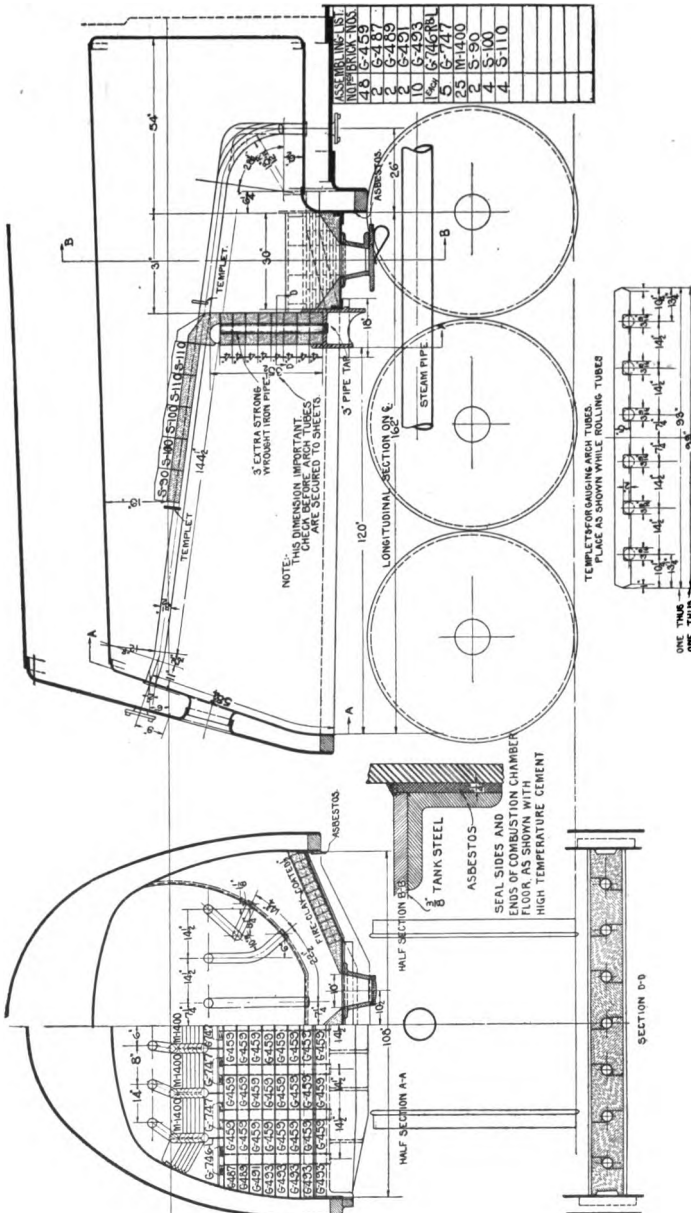
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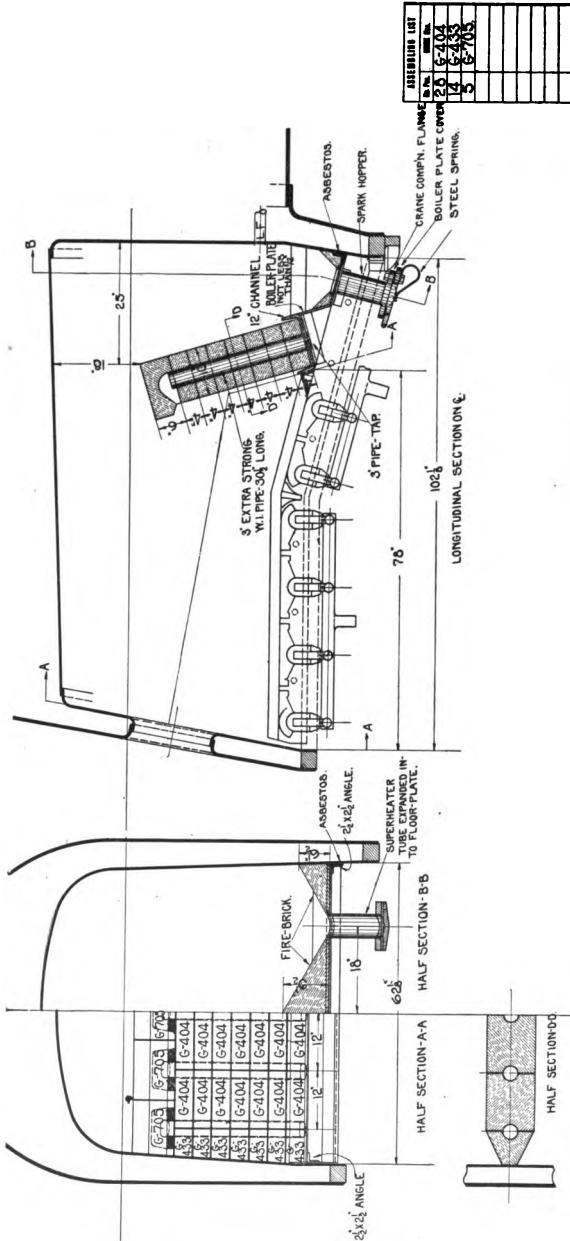
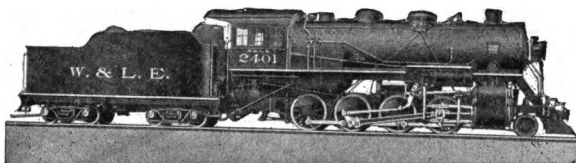


FIG. 2. TBM LATEST NEW FEATURE OF BRICK WALL

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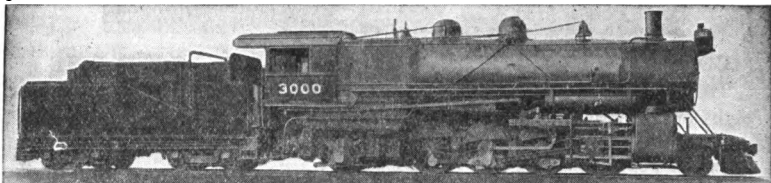
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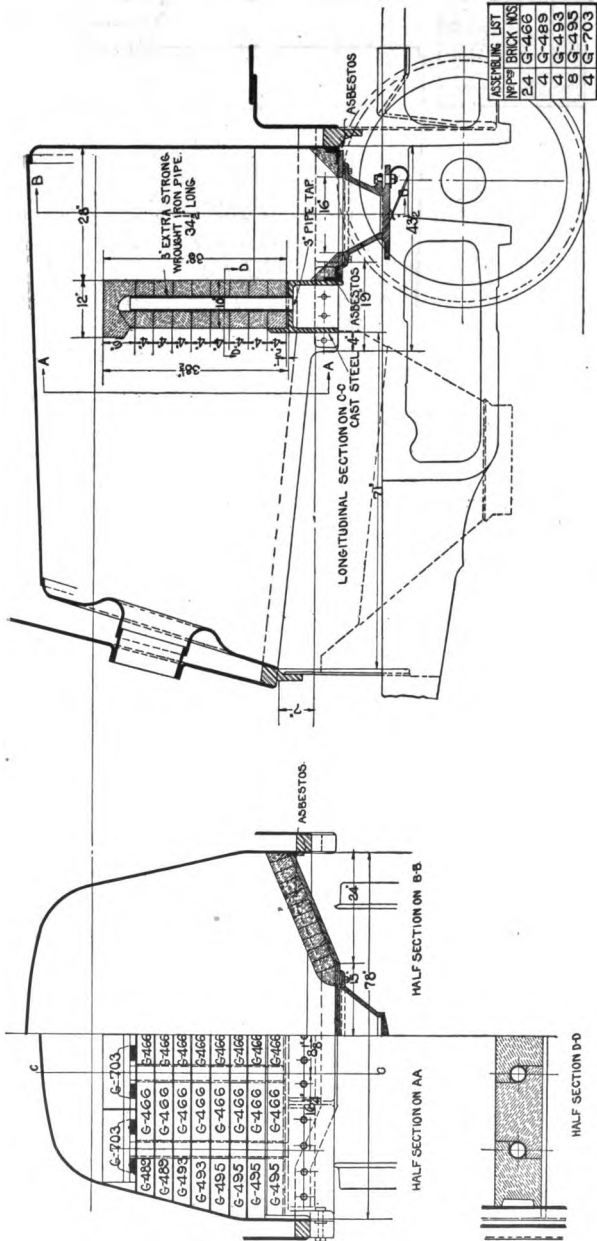


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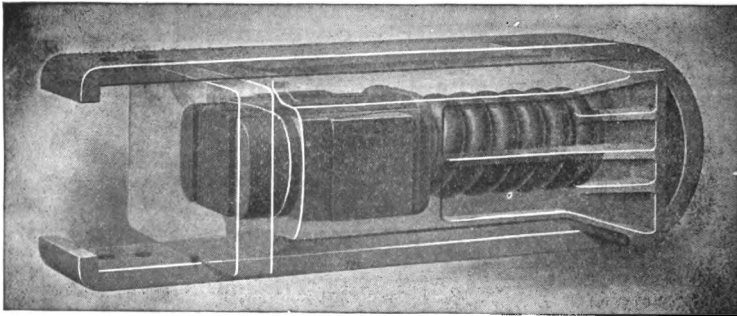
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improvement is in its experimental stages. The object of developing these vertical and inclined walls in this design of locomotive was to find something feasible that would reduce the amount of flue blowing and flue repairs.

The first and reasonable objection was the reduction of grate surface necessary for foundation of the brick wall. Tests are very encouraging along these lines. We are beginning to believe that the grate surface of the two front grates in a long, shallow firebox is of comparatively little use, and that the presence there of a hot refractory wall instead is of more benefit.

DESIGNS NOW IN SERVICE IN TESTS ABOVE MENTIONED.

The vertical and inclined walls are all constructed with air passages through the wall, except Fig. 4, so that a liberal quantity of free air is forced into firebox above the fire. Locomotives equipped with these walls are in the same class of service that they were in previous to the wall being applied, and they are steaming better, showing a decided improvement in combustion and smoke condition, and the blowing and repairing of flues being nearly eliminated.

Some fuel economy is being realized in every case, but enough fuel tests have not been made to strike a general average.

QUESTIONS OFTEN DISCUSSED.

1. Are arches responsible for cinders banking on them?

Answer. Arches are designed to be self-cleaning, and are self-cleaning when the draught arrangement is adjusted to suit brick arch conditions, but there are exceptional cases. The tendency is to blame the arch when the trouble is elsewhere. To overcome this undesirable condition, arches are sometimes moved back from the flue sheet, or one or more rows of brick left out entirely. I have known cases where the arch has been shortened so that the lower flues could be blown out without dumping the fire.

If we expect arches to perform their full duty, they should not be changed from their original designs, unless it is proven that it is absolutely necessary. The trouble should be located, and all other remedies tried before the arch length is changed.

A reasonable comparison which can be made—one which applies directly to these cases—is the adoption of the self-cleaning front end. The troubles and expense to which railroads were put before the adoption of self-cleaning front ends are within reach of some of our memories.

When there is trouble from the banking of cinders on the arch, it is an absolute certainty that the front end arrangement is either inadequate to perform its proper function, or it is not adjusted to brick arch conditions.

I believe you will find upon careful investigation that a locomotive that cleans its front end perfectly, does not have cinders banking on the brick arch under normal conditions. This does not mean that cinder-banking cannot be regulated to some extent by manipulating the arch, but why reduce the efficiency of this important equipment unnecessarily?

2. Should there be any space between arch and flue sheet?

Answer. This question has caused considerable discussion, illustrating its importance, and on account of the variation of opinions on this question; also the fact that some divisions of a railroad close up this space while others use spacer blocks; also that each arch user can make a test with no extra cost or detriment to power, we are justified in classing this as a local condition. If question No. 1 is a 100 per cent. question, No. 2 will be eliminated.

3. Do arches make crown bolts leak?

Answer. Positively, no.

The chief causes for crown bolts leaking are as follows:

1st Imperfect application.

2nd Indifferent care of fire at terminals.

3rd Scale or substance on crown sheet.

4th Low water.

A perfectly threaded joint cannot leak. If threads on bolt and on crown sheet match correctly, and reasonably good judgment is used in application, the job will be perfect. Careful inspection of leaking bolts after they are removed will show positively why they leaked. This being true, why blame the arch?

4. Arch Tubes.

With the growth of the use of locomotive brick arches, the number of arch tubes has increased. The first annual report of the Chief Inspector of Locomotive Boilers to the Interstate Commerce Commission for the year ending June, 1912, reports 18 arch tube accidents. The second annual report ending June, 1913, reports 20 accidents. Taking the number of locomotives estimated as being equipped with tube supported arches, there are between 60,000 and 70,000 arch tubes in use; therefore, the percentage of accidents is exceedingly low.

In reference to local arch tube trouble, which consists chiefly of imperfect materials and bulging and blistering:

Blisters are caused by imperfect material. Bulges are caused by scale accumulation inside of tubes.

These troubles are being overcome very rapidly by running a mechanical cleaner through the arch tubes when the boiler is washed and

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by more careful selection of materials. Some railroads check arch tube cleaning by including this item on their monthly inspection reports, or in other words, the boiler inspector has to inspect and sign up that this work has been done.

Of the arch tube accidents reported to and inspected by the Federal Inspection Bureau, 80 per cent. were due to causes which could have been overcome by greater care in inspection.

MR. H. D. SAVAGE—Mr. President, in reading Mr. Wagstaff's paper, it occurred to me that many members present have been to several brick works and have seen in use other methods than those described in Mr. Wagstaff's paper. There are quite a number of methods of manufacturing brick, but Mr. Wagstaff, I think, was discussing the very best and most modern method used in the manufacture of our material. I do not want to take up the time and bore you with a description of these other methods, but if any question occurs to any member as to the manufacture of brick or the use of brick I will be very glad to endeavor to answer the questions.

MR. HOGAN—I note that Mr. Wagstaff states on page 3 that "there are three varieties of clays used in the manufacture of arch brick," but he has not informed us, if I read it correctly, which of the three varieties the American Arch is manufactured from.

MR. WAGSTAFF—I will make a note of that, Mr. Hogan.

MR. HOGAN—On page 10 Mr. Wagstaff states: "This does not mean that cinder-banking cannot be regulated to some extent by manipulating the arch, but why reduce the efficiency of this important equipment unnecessarily?" Now that is correct, Mr. President. In days gone by we blamed the arch for the accumulation of cinders on the arch. For a number of years we felt that the arch had to be spaced from the sheet from five to six inches so as to prevent the accumulation of cinders, but I believe all railroads have learned in recent years that by properly drafting the locomotive, the arch while down next to the sheet will keep free from cinders. That has been my experience. On page 11 I observe this statement: "In reference to local arch tube trouble, which consists chiefly of imperfect materials bulging and blistering: Blisters are caused by imperfect material. Bulges are caused by scale accumulation inside of tubes." Now I believe there is one other cause: Imperfect application or imperfect belling of the tube in the sheet. Mr. Wagstaff has referred to and produced sketches to show what is known as the Gaines arch and the bricking-up of old locomotives, which I think will be very interesting to the members if he would explain a little further. To a majority of railroads the Gaines arch is unknown so far as having experience with it is concerned. From what we learn they are giving good satisfaction. We might say considerable on the brick arch and its use,

Mr. President, but Mr. Wagstaff's paper is confined to the material of which it is composed, and I presume he deemed this preferable to treating on the usefulness of the arch, feeling, as most railroads do, that it has proved itself one of the necessities in connection with locomotives in the way of producing economy and obtaining good results in locomotive operation—the economical use of fuel and the protection of flues. Going back to the matter of accumulation of cinders on the arch, we for a number of years attributed that to a great extent to improper firing. We often blamed the poor fireman for covering the arch with cinders when we men were at fault for not properly drafting the locomotive.

MR. PICKARD—Mr. President, Mr. Hogan has placed considerable stress on front end design and adjustment to keep cinders from the back of the arch when the same is placed against the tube sheet. I should like to ask, with the Master Mechanics standard recommended front-end arrangement, just what changes are required to keep the cinders from accumulating or depositing on top of the arch.

MR. HOGAN—None, after we got the self-cleaning front-end. That was the beginning of relief from those troubles. A properly equipped self-cleaning front-end will keep the brick arch clean.

The PRESIDENT—Is Mr. Wanamaker, Superintendent of Shops of the New York Central in the room? (No response.) I believe he agreed to contribute to the discussion. Is Mr. Hassett of the New York Central present? (No response.) Mr. Brigham, Road Foreman of Engines of the Pennsylvania.

MR. BRIGHAM—Mr. President, I am not prepared at this time to discuss the subject of brick arch to any extent, not having obtained any necessary data. We have had, however, much experience with brick arches on the Buffalo division, and we consider their use very economical, both as to fuel and also on flue repairs.

We have obtained very good results since the installation of the brick arch. The trouble we previously experienced of flues becoming clogged has been greatly reduced. We are not troubled to any extent by accumulation of cinders over the arch, the design which we now have in use on the Buffalo division, giving very good results in this respect.

The PRESIDENT—Gentlemen, the meeting is now open for discussion on the part of anyone who can contribute something.

MR. TALTY—Mr. President and members, I believe that I am on record before the Central Railway Club as saying that I was very much opposed to the brick arch. My experience with the brick arch when I made the statement was firing the narrow fire-box footboard engine hauling a passenger train between Buffalo and the next division

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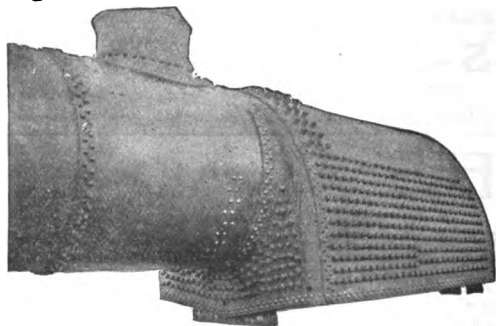
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terminal. Very frequently I was requested to knock the fire brick down in the fire-box so that the engine-house staff could clean out the tubes. This practice was frequent. Since the introduction of high-pressure locomotives I am convinced that for all classes of service there is economy in fuel consumption when locomotives are equipped with a brick arch. The conditions are so different on the various railroads that perhaps the same application or placing of the arch would not apply to all railroads. The New York Central Lines use a class of bituminous coal for their passenger service superior to that of many other railroads, and perhaps the brick arch could be set close to the tube-sheet and get good satisfaction by it being so located; but whether that would apply to all the railroads of the same class entering New York State is a question which is debatable. I believe that when the bituminous coal is of a very fine nature, that when a locomotive engineer works the locomotive so as to get a full efficiency out of the locomotive, it will cause accumulation of cinders on the arch, when the arch is set close or set tight to the tube sheet. Therefore, I believe that it is like the draft of locomotives; that each and every respective division must work out its own plans in order to get the best service from them. As a general proposition I believe that the brick arch on the high-pressure superheater locomotive saves fuel, increases the steaming qualities and thereby increases the efficiency of the locomotive. I base my opinion on practical experience.

I would like to go on record as stating that I believe the high-pressure locomotive can be made more efficient, whether using bituminous or anthracite coal, when equipped with the brick arch, than if not so equipped, thus causing the locomotive to render better and a more economical service to both the mechanical and transportation departments.

The PRESIDENT—Mr. Talty shows what we can do when we get started, gentlemen. Let's hear some one else have a crack at the paper.

MR. TALTY—Mr. Buckbee is here. He has had good experience on a railroad that maintains its power to quite a high standard, and he has also had experience with superheater locomotives. I would like to hear from Mr. Buckbee.

The PRESIDENT—I am glad you spoke to Mr. Buckbee, because I asked him and he didn't respond very clearly. Now, Mr. Buckbee, you can't say "no" to Mr. Talty.

MR. BUCKBEE—Mr. President, on page 10 of Mr. Wagstaff's paper, under the head of "Questions often discussed," I note the second question.

"Should there be any space between arch and flue sheet?" *Answer.* This question has caused considerable discussion, illustrating its importance, on account of the variation of opinions.

I believe it is quite well known that even on one railroad certain divisions of that line run successfully with the arch close to the sheet where other divisions find it necessary to set the arch back four to six inches, or whatever the case may be. I believe Mr. Talty has touched on the question, but it does not seem to me that there should be any opinions on the subject; it is either right to put the arch close to the sheet or it is wrong. If there are local conditions that enter into the question, that make it necessary to move the arch back from the sheet, I believe Mr. Wagstaff can explain them. I have, in my railroad experience, maintained engines—narrow fire-box engines and wide fire-box engines—with the arch close to the sheet and I believe that is the proper way to run them. If there are any conditions under which that cannot be done successfully, I should like to know more about it.

I do not altogether agree with Mr. Talty in regard to the nature of the fuel and the working of the engine. I have done it with all kinds of fuel—fine coal and coarse coal, low-volatile and high-volatile, and found only one reason for moving it back. We are assuming in this case that the engine is properly drafted so that it will keep the arch clean. The trouble that I found was due to flue leaks. I do not mean very bad flue leaks, but slight leaks that interfere with the passing of the sparks through the flues. And I also found that our engines, after showing good mileage and the flues began to weaken a little, that occasionally they would make a very bad failure. These failures were due entirely to flue leaks that very often resulted in an out-and-out failure where we had to cut the engine out, and we often found the cinders banked up on the arch two feet high. For that particular reason we found it necessary to move the arch back. I believe that the electric welding of the flues in the sheets, is going to overcome that trouble to some extent. If there are any other reasons why we should move the arch back from the sheet, I should like to ask the author of the paper to explain them.

Mr. TALTY—In reply to Mr. Buckbee's inquiry. He stated that on occasions it was necessary to place the brick arch or space it away from the flue sheet. I have fired the narrow fire-box locomotive equipped with the brick arch and I have fired the semi-wide fire-box equipped with a brick arch. We all can realize that with the narrow fire-box locomotive a greater vacuum is created in the smoke box of a narrow fire-box locomotive per square foot of grate area, at each exhaust, than takes place on locomotives having the wide fire-box. In other words, there is a greater draft through the same area of grate opening. Assuming this to be a fact, I have known on several occasions that if the fire was burning bright on a narrow fire-box locomotive, and if the coal was of a fine nature two or three scoops of coal placed on the fire and a rapid rate of combustion was taking place, the coal was to a large extent drawn over the fire-box and plastered up against the flue sheet in a conglomerated state, destroying the draft and no doubt this condition was responsible for the sudden rate of contraction and the cause of

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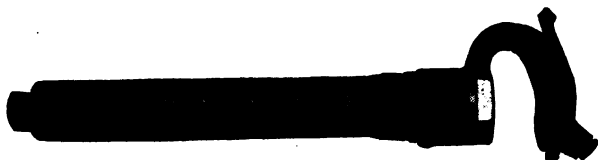
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the flues leaking, as Mr. Buckbee stated. If, when running a locomotive, you do not have to utilize its full efficiency, and the grade of coal is coarse, then the liability of cinders being drawn over the brick arch is reduced to a minimum; but, on the other hand, if you have to work the locomotive so as to get its full efficiency, and the grade of coal is fine, gentlemen, you will find that the coal will be drawn over the brick arch and form an accumulation of cinders there that will affect the steaming qualities of the locomotive, and cause later troubles. Therefore, if the conditions are as I have stated, I believe the better way would be to place the arch a short distance from the fire-box tube sheet.

MR. PICKARD—Brick arch installation is modern practice and a modern locomotive is equipped with an arch. The economies are many: In fuel, the burning of grades that without an arch could not be handled as successfully as with the arch; finer grades also; the protection of the flues which necessarily means a saving in boiler work and prolonging the life of flues. An arch will prevent, also, honey-combing when the fuel is not properly handled. It has been my privilege to use coal (bituminous) found in the fields of Arkansas, Indiana, Illinois, Michigan, Pennsylvania and the Virginians, and it has been my experience that the best results are obtained by running the arch 3 to 5½" from the tube sheet. We are spacing our arches at present 5½" from tube sheet in both bituminous and anthracite coal burning locomotives. According to my experience, in placing the arch to the sheet, ashes and cinders accumulated on top very readily and soon shut off the bottom flues, causing steam failure. On locomotives using anthracite, where an exceptionally heavy draught is required, for instance on Pacific type engines 25x28—200 pounds steam pressure, handling passenger trains weighing around 800 tons, the vacuum in the front end about 14 to 15" on cut-offs ranging from 15 to 17", superheating to the maximum of 670 degrees has a very much greater tendency to raise this grade of fuel and deposit it on the arch; therefore, we came to the 5½" spacing. In practice we first look for proper steaming, and then economy. In the Indiana and Illinois districts, of which I mentioned the Arch Company recommended a spacer. I would say 5" is a fair figure in this locality.

MR. TALTY—Is that your bituminous or anthracite?

MR. PICKARD—Bituminous and anthracite.

MR. TALTY—How much?

MR. PICKARD—Five inches in the anthracite district, where we burn five different grades, which give best results where the 14" vacuum is reached on heavy grades.

MR. TALTY—What speed?

MR. PICKARD—About 30 miles per hour. On an engine of this type it will fill up rapidly and as soon as this takes place the use of the lower tubes has been lost and, therefore, the loss of a free steamer also.

In answer to the gentleman's question on accidents with arch tubes: You must have a thorough organization and record; and see that they are kept so. With proper treatment, failure of arch tubes can be practically eliminated. Inspection will bring out tubes that blister and a proper mechanical cleaner will keep out deposits of mud and scale and prevent bulging. This must be done thoroughly at each washout. I agree with Mr. Hogan that a number of tube failures are due to improper installation. Some which I have been called in on were due to not entering the sheet at right angles; others cracked by too much working and one by heavy gauge tubing used. There was accumulation of scale in one case. There cannot, in the opinion of the speaker, be too much stress laid on the latter case. We have fire boxes containing as high as five tubes supporting the arch, No. 7 gauge being used, 3' diameter; a copper ferrule being used on both ends. Some installations have been made without copper, but the best results come with it in this district.

MR. TALTY—Mr. President, I think we have a member with us today who runs one of the most important trains on the New York Central and I believe the locomotive is one of the modern type, equipped with a brick arch. I refer to Mr. Haley, of the New York Central. I would like him to tell the members what he thinks of the brick arch applied to a modern locomotive in fast passenger service.

— The PRESIDENT—We will be glad to hear from you, Mr. Haley.

MR. HALEY—I didn't expect to be called upon here and I haven't looked over this paper, but as far as the brick arch is concerned, we have been using it for a great many years. Considering the standard of engines we are using at this time, the kind of work that they are doing, and the kind of coal we are using, I think it would be impossible for us to do business without a brick arch. Of course, you all know that the size of engines we have today isn't as it was years ago. In those days we thought nothing of having a flue leak, or two or three flues; but now it seems the larger an engine the easier it is to kill her. If you have but one flue leaking, no matter what kind of fuel is used, it seems these engines won't do business; that is, they won't make steam. As far as the brick arch is concerned I have never made much of a study of it. Of course, I have run all kinds of engines, in all my years of service. I do know that with the brick arch we are using, the engines of the New York Central are giving good service—they are steaming good with

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it,—that is, when you get the stuff to do it with, when you have the coal to do it with, and even with a poor quality of coal.

MR. PICKARD—Mr. President, in answer to Mr. Wagstaff's inquiry referring to the paper, and to bring out the commercial end of it, I will offer as exhibit "A" statement showing cost of maintenance on 20 locomotives equipped with arches covering new brick, care, and labor for a 30-day period. These locomotives are of the Mikado type 28 x 32, 312,000 pounds total weight; 57,100 tractive power, making approximately 3,500 miles per month. The arches are supported by four 3" No. 7 gauge tubes; the full arch containing 34 pieces of brick. As Exhibit "B" I will submit the result of a test which will show saving with arch and without. The test was conducted in the Indiana Territory using West Virginia bituminous coal and is a fine example of the economy to be arrived at by the use of the arch. I will submit as Exhibit "C" sketch of a clamp used for keeping arch tubes in alignment which may be of some interest to our members.

EXHIBIT "A"

COST OF MAINTENANCE—BRICK ARCHES—APRIL 3RD TO MAY 3RD, 1914

Engine	Brick No. 1800 31c. ea.	Brick No. 5 5c. ea.	Brick No. 110 23c. ea.	Brick No. 120 25c. ea.	Brick No. 130 27c. ea.	Brick No. 140 29c. ea.	Brick No. 180 37c. ea.	Cost of Brick	Labor to Apply	Total	
1200 class	18	..	..	..	..	..	..	\$ 5.58	.18	\$ 5.76	
.....	13	..	..	..	..	..	..	4.03	.13	4.16	
.....	17	..	..	2	..	2	..	6.35	.21	6.56	
.....	17	..	..	..	..	..	..	5.27	.17	5.44	
.....	17	2	..	..	..	..	..	5.37	.19	5.56	
.....	25	4	..	1	2	..	..	8.74	.32	9.06	
.....	7	1	1	..	1	..	..	2.72	.10	2.82	
.....	9	..	..	..	..	..	..	2.79	.09	2.88	
.....	17	..	1	2	1	1	..	6.56	.22	6.78	
.....	22	..	..	..	..	..	..	6.82	.22	7.04	
.....	10	..	..	..	3	..	..	3.91	.13	4.04	
.....	14	..	..	..	..	..	..	4.34	.14	4.48	
.....	24	..	..	..	..	..	..	7.44	.24	7.68	
.....	19	1	..	2	..	..	..	6.44	.22	6.66	
.....	8	..	..	..	..	..	..	2.48	.08	2.56	
.....	18	2	..	..	..	..	..	5.68	.20	5.88	
.....	3	..	..	..	..	..	..	.93	.03	.96	
.....	18	4	..	..	..	..	..	5.78	.22	6.00	
.....	18	..	2	2	3	1	..	7.64	.26	7.90	
.....	28	4	2	..	..	3	..	10.21	.37	10.58	
20 engines.	Total cost per engine, \$5.64 (average).							Total.....	\$109.08	3.72	\$112.80

EXHIBIT "B"

Statement showing test of engine equipped with brick arches as compared with engine not so equipped. Five car train.

(Engine without brick arch).

Weight of tank, engine	light 44520 lbs.	
Weight of tank, engine water loaded	85700 lbs.	
Weight of tank, engine, water and coal,	114800	coaled from C. & O.
Number of scoops of coal I.	to R.	252
	R. to C.	105
	C. to H.	261
	H. to C.	152
Total scoops of coal on train.		770
Engine returning on	Engr. and Fireman	
took on 9000 lbs. coal at	St. coaling station from C. & O.	
Number of scoops of coal used between G.	& H.	180
	H. & C.	221
	C. & R.	97
	R. & I.	189
Total.		687

SUMMARY

28100 lbs. of coal taken on at.

9000 lbs. of coal taken on at.

37100 lbs. total taken on tank.

On arrival at. there still remained in the tank 10,280 lbs.

Amount of coal in pounds used 27,100 lbs. or 13 tons; 550 lbs.

Took at 4,920 gallons of water; weight of water 41000 lbs.

Amount of water in ft. remaining in tank at 1' 4" 1460
gallons and 12,166 lbs. weight.

Amount of water remaining in tank at 1' 11" 2099
gallons and 17,491 2/3".

Amount of water in ft. remaining in tank at 1' 11" 2099
gallons and 17,491 3/3".

(Engine with brick arch).

Engine train Engr. Fireman

Weight of tank without water, 40,000

Weight of tank with water, 82,000

Weight of tank with coal and water, 105,000 coaled at

Engine left with 23000 lbs. coal

Number of scoops of coal used from I.	to R.	180
	R. to C.	62
	C. to H.	170
	H. to C.	150

Total scoops of coal used on division. 562

EXHIBIT "B"—Continued

3000 lbs. coal taken on at St. for run on	
Scoops of coal used from C to H	140
H to C	158
C to R	81
R to I	145
Total scoops of coal used on division	524
Engine returning on took at St. 4,920 gallon water-weight of water 41000 lbs.	
Amount of water remaining in tank at H 2' 6" 2,739 gal lon and 22825 lbs. weight.	
Amount of water remaining in tank at C 1' 2" 1,282 gal- lon and 106831½ lbs. weight.	
Amount of water remaining in tank at Indianapolis 1' 7" 1,734 gal- lon and 14450 lbs. weight.	
Total amount of coal used 27100 lbs.	
Total amount of water used 9102 gallon.	
Total amount of water used in pounds 75852.	
Capacity of tank engine, 2920 gallon; 41000 lbs. weight.	
Arrived at Conn. in with 1' 8"; 1826 gal. and 15216 lbs. wt.	
H 1' 10" 2008 gal. and 16753 lbs. wt.	
C 1' 11" 2009 gal. and 17491 lbs. wt.	
Total amount; Gallons 8917 and 73540 lbs. water.	
Returning on , engine ; 4920 gallons; weight 41000 gallon.	
Arrived at H . . . on No . . . with 2' 6"; 2739 gal. and 22825 lbs. wt.	
C 1' 9"; 1917 gal. and 5975 lbs. wt.	
I 1' 8"; 1826 gal. and 15216 lbs. wt.	
Total amount water in gal. used in ; 9,278 gal. and 68984 lbs. wt.	
Total amount coal in lbs. used in ; 7,500 lbs.	

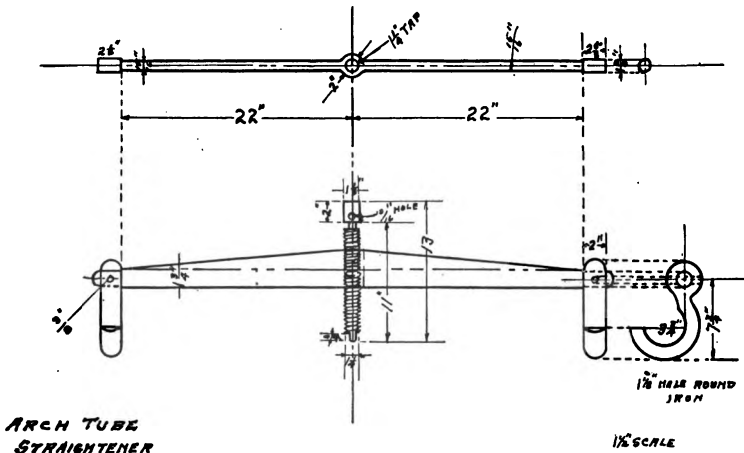
SUMMARY

Engine on and ; 5 cars 250 miles.
 Total amount of water used engine 142,524 lbs.
 Total amount of coal used engine 17,000 lbs.
 Pounds of water evaporated to one pound coal 9.5 lbs.
 Average miles made per ton coal 29 miles.
 Engine on and ; 5 cars 250 miles.
 Total amount water used engine 150,494 lbs.
 Total amount of coal 27,100
 Pounds of water evaporated to one pound of coal 5.5 lbs.
 Average number of miles per ton of coal 18 miles
 Engine burned 27,100 lbs. of coal at .0009 per lb. or \$23.49.
 Engine burned 17,000 lbs. of coal at .0009 per lb. or 15.30.
 Amount saved by brick arch engine 10,100 lbs. at .0009 or \$8.19.

EXHIBIT "B"—Continued

Engines are			
2-8-0 type	Engine Nos.	724 and 796	796
21"x26" Cyl.	Arch.....	without	with
57" Wheel	Engine miles.....	5366	3885
200 lbs. steam	Car miles.....	250002	173682
34,200 F	Ton miles.....	12581916	8738695
53.A.sq.ft.G.A.	Coal.....	991282	637051
2744 sq.ft.H. S.	Coal per eng. mile..	184.7 100%	164.2 88.9% 11.1%
178,000 lbs.			
total wt.	Coal per 100 car mile	396.5 100%	366.8 92.5% 7.5%
158,000 lbs.			
wt. on driv.	Coal per 1000 ton mile	78.7 100%	72.9 92.7% 7.3%

Throughout this test the conditions were constant with the exception of the weather, which was somewhat harder when engine 796 was being tested with the arch than at the time when it was tested without the arch.

EXHIBIT "C"

The PRESIDENT—That will be very interesting, I think, Mr. Pickard.

MR. PICKARD—That includes the cost of maintenance and economy under different test conditions on different classes of locomotives.

MR. HOGAN—I would like to ask Mr. Pickard if the flues will plug any quicker without the arch than with it?

MR. PICKARD—I presume you refer to honey-combing, do you not?

MR. HOGAN—Plugging a flue entirely, or both.

MR. PICKARD—With the arch it is about 50% less. With any fuel that I have had the privilege of handling, the honey-combing and clinkering was due to the handling of it.

MR. HOGAN—Mr. President, that has been my experience, that you will plug twice as many flues without the arch, which means reducing the efficiency of the locomotive. Therefore, under any conditions the brick arch is an improvement.

MR. TALTY—I do not agree with Mr. Pickard's statement that the honey-combing of the flues and the formation of clinkers are due to the handling. I have fired a locomotive for a period of 12 years. During that time I handled both bituminous and anthracite coal, and my experience has been,—that when the locomotive is handled so as to get from it the fuel traction effort, and when the rate of combustion is rapid, if the bituminous coal is of a fine nature, it will be drawn over the fire quickly, and before giving off the heat contained in it, will be plastered against the fire-box tube sheet in a conglomerated state, the draft through the flues being thus restricted and so causing low steam and boiler troubles.

MR. PICKARD—Several years ago in St. Louis, the Superintendent of Motive Power of the Cotton Belt and myself came pretty near getting thrown out a ten-story building for making that statement. If you want to see something started around a club meeting, mention honey-combing and clinkering of coal.

The second year following this St. Louis club meeting, the Fuel Association met in Chattanooga. A number of the members who were of the same opinion as our friend who has just spoken, at the first meeting of the Fuel Association, visited different points where fuel was being handled without clinkering and honey-combing. The following year they so reported to the convention. An open confession is good for the soul and we had a good number. It is a matter of education. This statement has not only been made by the speaker, but by others. Our friend said he was on record as opposing the arch some years ago and I believe in time to come he will change his opinion about handling fuel. My position is that I can do what the other fellow is doing,—maybe not quite so good at first, but with careful study and observation, and a little time, we can do as good as our neighbor.

About seven years ago I was Master Mechanic on a road running through Indiana and Illinois. We used southern Illinois mine run bituminous coal. We had a 202-mile division. Engines were changed three times on account of heavy and clinkered fires, using more engines

than seemed necessary. One day a young fellow about 25 years of age and possibly weighing 120 pounds, strolled into the office, looking for a job "faring". You will notice I say "faring" because he came from Arkansas. We did not need firemen but he put up such a plea that we put him to work and some time after he caught a through job on the 202-mile division. At the first cleaning point, the engineer said: "We had better change engines." The fireman wanted to know what for and was told on account of dirty fire. He told the engineer he was in good shape and as the engine was a good steamer, he did not think it was necessary. The engineer found three to four inches of fire and decided to go on to the next point, where he was sure to get another engine, but upon examining the fire at that point found it in good shape and then decided to go through. The following night they returned with the same engine. Well, everybody "sat up and took notice", so I sent the Road Foreman out with this fireman to find out if possible how he handled his fire and our particular grade of fuel. He was whistling and riding half of his time and he could do the stunt every night. Our investigation developed that this boy was on the job long before his engine was due to leave the enginehouse and establishing his fire properly before starting on the trip, supplying just enough coal that his fire would not fill up, and gave her time to burn the coal. Not once did he take the hook from the tank or place his hand on the shaker bar. We started a campaign of education among our firemen and it was not long before they were doing the same thing.

You will find that the fellow who is continually shaking and raking his fire, has the heaviest fire at the end of the division. You find other men who can handle a fire and do it easily without hook or grate shaking and this fire can be shaken out in one or two minutes, while the others require 30 to 40 minutes to get out. Now, why is that? It is the handling. One man is using his "old nut" and the other fellow his back. Burning coal properly is a chemical process and you put up a lot to the fireman. We know that to burn a given amount of coal, we must have the correct amount of air. You see that you are putting your fireman in the place of an operating chemist. He must establish his fire to permit the admission of the proper amount of air in order to secure proper combustion. You cannot stick a clinker to the flues, ashes are not fusible; therefore, some underlying cause is responsible for the honey-combing. Coal properly handled and burned will not give off honey-comb. I have seen steam failures fade away, fuel economy better and condition in flue trouble better by this practice and the words "poor coal" practically eliminated; therefore, I say the clinkering and honey-combing is due to the handling and difficulty due to improper method of combustion caused by incorrect firing.

MR. TALTY—Mr. President, before the closing of the discussion let me say that I don't know as I made myself just clear to the members who have not had practical experience. I do know that on probably

the greatest number of occasions a locomotive could be fired from one terminal to the other, week in and week out, and month in and month out, without any failure from low steam due to the tube sheet being honey-combed over. But from experience with the scoop shovel, that when the rate of combustion is rapid, occasionally when the fuel is fine, it will be drawn over the fire, and plastered up against the flue sheet.

The PRESIDENT—Is there any further discussion? If not, we will give the author of the paper an opportunity to answer the criticisms, suggestions or questions that have been stated by the members. Mr. Wagstaff.

MR. WAGSTAFF—Mr. President, I would suggest that Mr. Savage answer Mr. Hogan's question about the materials used in the brick.

The PRESIDENT—We should be very glad to hear from him.

MR. SAVAGE—I believe Mr. Hogan asked if the three kinds of clay mentioned were used in the American Arches?

MR. HOGAN—Any one of them.

MR. SAVAGE—The paper goes on to state about that, but I think it does not make it just clear that in the manufacture of any fire brick those three grades of clay in some form are used. There are, of course, very low grades of fire brick that are made perhaps from a plastic clay only. The three clays vary a great deal in their nature but not in appearance or in analysis. Fire clays are more peculiar in some ways than any raw materials that are handled; for instance, in iron ores, if a furnace man gets an analysis of an iron ore he can tell a great deal about the nature of the ore and the color perhaps it is going to be and the texture and the structure of it; but an analysis of fire clay does not reveal any of these things. A plastic clay—by that we mean a clay that when mixed with water, can be formed into a solid mass—will analyze very much as a non-plastic or flint clay which no amount of water can cause to bond or form a solid mass. The flint clays are supposed to be very much more refractory; that is, they will stand very much more heat than the plastic clay. In some localities that is true, in other localities it is not true. The plastic clays that are used by certain concerns in Kentucky will stand just as much heat as their flint clays. But while the flint clays are more desirable, a brick cannot be made of flint clay exclusively for the reason that you cannot form any bond; so a certain percentage of the plastic clays must be used to make the bond. Mr. Wagstaff refers in his paper to calcined clays. There is a great deal of shrinkage in all fire clays. Certain clays with which I am familiar shrink about an inch to the foot. Naturally, we must work pretty close to

dimensions and in making those brick we have to make the allowance. By pre-burning the clays or calcining them we take all the shrinkage out of them and in putting the calcine in the other mixture we limit to some extent the shrinkage of that. That is, without the calcined clays added it might shrink an inch and a quarter to the foot; when we put 20% of calcine in it shrinks about an inch to the foot. So that all three of those varieties are used in the manufacture of any brick. They are all ground. In the practice he refers to they are ground separately. In some places they are ground together. We believe the best method is to grind them separately and you can get your mixtures more nearly as you want them. It is the practice of a good many places to send a man out with a wheel barrow and get ten shovel-fulls out of this pile and ten out of that and a few from this pile over here, and if his mind is on his job, maybe he gets that mixture and maybe he doesn't. In the method Mr. Wagstaff refers to, these different clays are all ground and placed in separate bins and the man who mixes them has a car divided into spaces and these spaces are locked and he must fill each one of the spaces with this particular kind of clay and there is no variation in the mixture, which is essential to the strength of the brick, for too much flint or calcine will weaken the physical strength of the brick, making it easy to break in loading and shipping, and more likely to fail under severe conditions. Whereas, too much plastic makes it more apt to pop and crack when suddenly heated or cooled.

The PRESIDENT—Mr. Wagstaff?

MR. WAGSTAFF—Mr. Savage will answer Mr. Hogan's inquiry about the manufacture of clay?

MR. HOGAN—Yes.

MR. WAGSTAFF—Mr. Hogan also asked for a little further explanation of what we know as Fig. 2 in the paper. That is an inclined wall in a freight locomotive. And it might be necessary at this time, on account of the printer not getting the figures properly shown in the paper, Fig. 1 shows what we know as the Gaines fire box with a brick combustion chamber. Fig. 2 shows the freight engine that I spoke of, which is a locomotive that is six or seven years old, and originally had arch tubes and brick arch which was discontinued, owing to inadequate firing clearance. This inclined wall has been developed largely by Mr. F. F. Gaines on the Central of Georgia Railroad. The Arch Company has not urged the railroads for official reports of progress, because it is the wish of Mr. Parish, our president, to offer it to the railroads and let it work out its own salvation. On page 5 you will notice an item dealing with "the latest new feature of brick wall." This is not recommended to supplant arch tubes and sectional brick designs. There are a large number of locomotive fireboxes with very little throat depth at front

end, and the bottom row of fire tubes are so close to the top of the grates that it is not practicable to apply arch tubes and arches. This improvement is in the experimental stages. The object of developing these vertical and inclined walls in this design of locomotive was to find something feasible that would reduce the amount of flue blowing and flue repairs. The first and reasonable objection was the reduction of grate surface necessary for foundation of the brick wall. Tests are very encouraging along these lines. We are beginning to believe that the grate surface of the two front grates in a long, shallow firebox is of comparatively little use, and that the presence there of a hot refractory wall instead is of more benefit.

In regard to Mr. Buckbee's request that I make further suggestion as to the location of the tube sheet, I have heard so many discussions on that subject and I have been asked the question so often that I regret to say I cannot do better than repeat what I have said in the paper. On page 10 the question is asked "Should there be any space between arch and flue sheet?" "This question has caused considerable discussion, illustrating its importance, and on account of the variation of opinions on this question; also the fact that some divisions of a railroad close up this space while others use spacer blocks; also that each arch user can make a test with no extra cost or detriment to power, we are justified in classing this as a local condition. If question No. 1 is a 100 per cent. question, No. 2 will be eliminated." That brings me to the point Mr. Hogan spoke about in regard to draft. I found in visiting various railroads and talking to the men who used these arches that there are some divisions that have a space; that some other divisions close the space; on the same division you will find, in passenger locomotives, they close the space—put brick close to the tube sheet and in other cases leave four or five inches space, or whatever space they desire, so that we feel we are not justified in taking any positive stand on that as an arch company because the man that is using the locomotive surely ought to know which is the best method to use.

In regard to the paper and the discussions on the paper, gentlemen, I feel highly pleased that some of what I call the old chestnut arguments have not been brought up in this discussion. You know that for the last five or six years certain standard questions have always been asked. It doesn't matter what kind of an answer you make to them, they come up again and again. I do not think I ought to say any more except to express my appreciation of the very able manner in which the paper has been discussed. If there are any further questions you desire to ask, Mr. Savage and I will be very pleased to answer them. I thank you, gentlemen, for your kind attention.

MR. PICKARD—The paper has covered the ground very thoroughly, Mr. President, and is the result of much study, time and thought. I move that we extend to the author a vote of thanks for his work.

Mr. TALTY—Mr. President, I move that we give a rising vote of thanks.

The PRESIDENT—You have heard the motion. All in favor please rise. (Everybody rose).

Mr. WAGSTAFF—Thank you, gentlemen.

The PRESIDENT—We have been advised that the nominating committee is ready to make a report and we would be glad to hear from Mr. Bowman.

Mr. BOWMAN—Mr. President, the nominating committee have given serious attention to the duties imposed upon them, and in the interest of the Club and having in mind the continued prosperity of the Club, we are unanimous in offering for your consideration the following ticket: For President: H. C. Manchester, S. M. P. & E., D. L. & W. R. R., Scranton, Pa.; For First Vice-President, E. J. Devans, Gen. Supt., B. R. & P. R. R., Rochester, N. Y.; For Second Vice-President: D. R. MacBain, S. M. P., L. S. & M. S. R. R., Cleveland, O.; For Third Vice-President; W. H. Sitterly, General Inspector, Pennsylvania R. R., Buffalo, N. Y.

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The PRESIDENT—The report of the committee will be received and acted upon at the proper time. The election takes place in January. It gives me pleasure to announce that we have enrolled since the May meeting 17 new members. On account of the lateness of the hour, we will not at this time read their names, but they will appear in the Official Proceedings. The next order of business is the announcement of the paper for the next meeting, but that was covered by the Secretary in his opening remarks. If there is no further business to be brought before the meeting a motion to adjourn will be in order.

Mr. HOGAN—I move we adjourn.

Mr. TALTY—I second that motion. Carried.

Whereupon the meeting adjourned and the Club embarked on the boat for the return trip, arriving at the foot of Austin Street, Buffalo, at 7 o'clock P. M.

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Bulger, J. S. General Yard Master, L. V. R. R.,
1361 Abbott Road, Buffalo, N. Y.

- Conroy, James Air Brake Foreman, N. Y. C. & H. R. R. R.,
198 Buchanan St., Buffalo, N. Y.
- Crane, F. H. Engineman, B. C. R. R., 61 Imson St.,
Buffalo, N. Y.
- Gregory, Jos. N. . . . Manager, Dearborn Chemical Co.,
59 Franklin St., Buffalo, N. Y.
- Hilferty, C. D. . . . Travelling Rep., Locomotive Superheater Co.,
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Vol. 22

OFFICIAL PROCEEDINGS

No. 5

Central Railway Club

NOVEMBER MEETING, 1914

PUBLISHED BY THE CLUB

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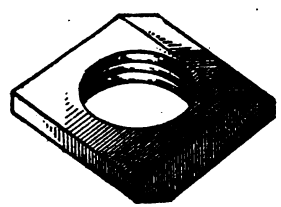
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NEXT MEETING, FRIDAY, JANUARY 8, 1915

The November Meeting

The regular meeting of the Central Railway Club was held at Hotel Statler, Buffalo, N. Y., Friday, November 13, 1914, at 8 o'clock P. M., the President, Mr. W. Elmer in the chair.

Those who registered as in attendance were:

Avery, W. E.	Dehnert, Paul L.	Johnson, L. T.
Armstrong, W. A.	Darlow, A. M.	Jefferson, H. F.
Bower, C. M.	Donahue, C. M.	Jones, W. F.
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Burnes, J. E.	Edwards, A. M.	Kennedy, Fred
Baach, F. Paul	Elder, John R.	Kraetz, William
Barrett, H. V.	Elmes, R. W.	Lewis, H. M.
Bostwick, W. S.	Ford, F. L.	Lawson, Alexander
Brown, H. G.	Foster, F. J.	Lowther, R. B.
Berg, A.	Taylor, N. J.	McNoldy, W. H.
Breese, S. E.	Gratton, James	McMunn, W. R.
Bucherer, Frank H.	Golding, Chester H.	Miller, R. S.
Barnaby, Robert	Griscom, Fred C.	Murphy, J. P.
Butts, H. M.	Gregory, Joseph N.	Murphy, M. J.
Brockway, Geo. P.	Gross, E. G.	Miller, C. W.
Barker, James I.	Grobe, W. L.	Mooney, E. P.
Buchanan, W. A.	Garvin, H. L.	Mischka, Edw. F., Sr.
Clare, George A.	Glenn, John F.	Mulford, George S.
Crone, A. E.	Ganson, F.	Moore, John
Croft, W. H.	Gardner, G. C., Jr.	Martin, P. A.
Coleman, E. J.	Gibney, James W.	Miller, B. E.
Conley, A. H.	Hassett, M. W.	Maycock, J.
Charlton, George I.	Huie, Charles F.	Mullett, W. C.
Colman, G. R.	Howard, G.	Neu, George H.
Clement, D. L.	Hubbard, F. S.	Oram, R. C.
Corey, Bloss P.	Harris, Elmer E.	Openshaw, E. H.
Carliss, Thomas E.	Hogan, C. H.	Owens, William
Davis, Donald C.	Hogan, Thomas	Pagelow, J. A.
Dodd, L. C.	Jenings, George W.	Pickard, F. O.

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Pratt, W. H.	Thompson, W. O.	Vought, Harry D.
Ruckel, John B.	Thompson, C. J.	Wannamaker, H.
Sill, S. J.	Toughey, T. F.	Wickersham, W. P.
Sims, M. L.	Trout, H. F.	Whalen, F.
Robinson, John	Tunkey, William	Waitt, George L.
Rust, M. L.	Teale, Percy P.	Wilson, James
Rosenhrans, G. E.	Treleaven, Thomas	Wheeler, Charles W.
Smith, Pierce G.	Turner, H. N.	Wilson, R. D.
Schlabach, R. P.	Tuma, Frank	Young, D. R.
Simmons, L. G.	Trowbridge, L. L.	Zimmer, H.
Schrader, J. R.		

The PRESIDENT—Gentlemen, please come to order now and we will begin our business session. The roll call will be dispensed with, as we have had the cards distributed and signed by all the members. The reading of the minutes of the meeting of September 11 can also be omitted, as they have been printed and distributed.

We have certainly never had so high a compliment paid to the Central Railway Club as we have had to-night by the Hewett Rubber Company. It seems to me fitting that we should take some unusual action in this case and not merely thank the entertainers by a rising vote or some such procedure. I will, therefore, appoint a committee to draft suitable resolutions, which may be presented to the Hewett Rubber Company. I will ask Mr. W. H. Sitterly to act as chairman of that committee, with Mr. David D. Robertson of the Lehigh Valley and Mr. F. C. Pickard of the Lackawanna as his associates. If those gentlemen can find time during the evening to draft the resolutions we will have them suitably prepared for presentation to the Hewett Rubber Company.

I am sure we all feel a deep sense of gratitude for the very pleasant entertainment we had this afternoon, and the very instructive trip through their factory. Those who are present will remember for a long time the very delightful dinner which they so kindly tendered to us this evening.

The next order of business is the report of the standing committees—the Executive Committee, by the Secretary-Treasurer.

The SECRETARY—Mr. President and gentlemen, at a meeting of the Executive Committee this morning, a report was made by the committee on speakers and toastmaster for the annual dinner next March. The committee has secured the acceptance by a prominent and well-known popular official, of an invitation to serve as toastmaster on that night.

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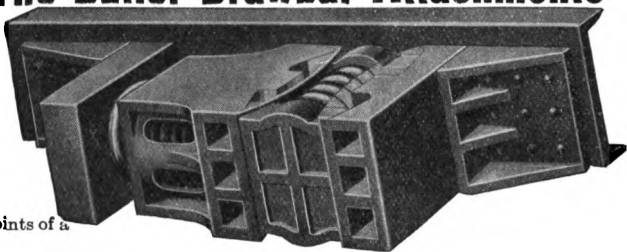
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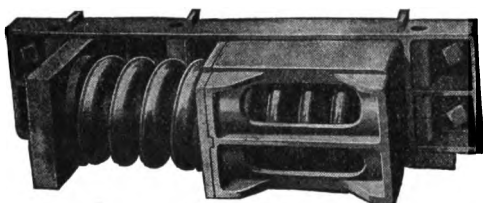
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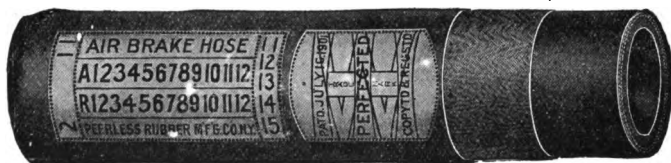
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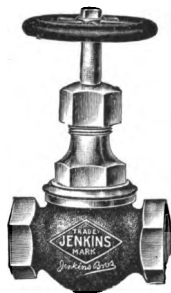
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A number of speakers are under consideration. The intention is to have only three, the addresses to be sufficiently limited to afford an opportunity to enjoy some additional entertainment. For our May meeting we are to be favored with a paper by Mr. S. S. Riegel, mechanical engineer of the Lackawanna Railroad, on "Locomotives of Recent Development."

The Executive Committee regrets to announce that since our last meeting we have lost by death two well known members, to whom proper tribute has been paid by the insertion of a memorial page in our September Proceedings—Mr. Charles M. Gould, Vice-President of the Gould Coupler Company, and Mr. Frank W. Chaffee, General Car Inspector of the New York Central.

This seems to cover the business handled by the committee in which you would be specially interested with the exception of an announcement to be made later by the President with respect to our January meeting.

The PRESIDENT—The next order of business is the usual paper of the evening, and it is with pleasure that we are able to welcome to-night one of the representatives of one of the largest paint concerns in the world. I have great pleasure, therefore, in introducing Mr. Milton L. Sims, the manufacturing expert of the Sherwin-Williams Company, who will read a paper on the painting of steel car and locomotive equipment.

MR. SIMS—When, a few weeks ago I received an invitation from your worthy Secretary to prepare a paper to read before this meeting, I thought at first it would be a very simple matter. But on further consideration, and in view of the meeting being scheduled to take place on Friday the 13th, then I seriously doubted whether I could put to rout the jinx that is supposed to be around when Friday and the 13th come together. Looking into it still a little further, and remembering that I was to endeavor to interest a body of men such as is before me to-night, after they had been regaled with such a sumptuous repast as we have had here, then, as I heard an old negro say once in the South: "I got cold up to my knees."

It has been said, and truthfully so, that the way to a man's heart lies through his stomach. The corpulency of the stomachs of some of the railroad officials that I have met would require the construction of a McAdoo subway tunnel to get within shooting distance of their hearts; and that is said with no disrespect to any of the railway officials to whom I refer, because I have a very warm spot in my heart for railroad officials. I thought, however, that I would, as a perfect stranger to all of the members present, be able to get somewhere close to the door and slip one over on you and get out. But, much to my surprise, when I entered this hall to-night and began to look around, I saw that I was caught. I saw before me, first, a gentleman whom I have had the pleasure of knowing for a great many years, who is a competitor and, I am sorry to say, sometimes a more successful competitor than I would like—Mr. Joseph Maycock, a gentleman whose acquaintance I have enjoyed for probably 30 years or more. Then I saw Mr. H. M.

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Butts, another gentleman whom I have had the pleasure of knowing for many years. Later on I happened to see Mr. "Ben" Miller of the Lackawanna, whom I have also known for years. Over to my left I see Mr. Breese, the master painter of the Lake Shore & Michigan Southern Railroad. Having no chance to talk to them at all, to get them to go easy on me, all I can say now is, I will have to do the best I can, and when I get through, while I know that my subject is a vulnerable one, if you will just kindly refrain from using any 42-centimetre guns on me, why, perhaps I will be able to get through without any serious loss.

Now I have seen a hall completely cleared of its occupants who expected to listen to a very long-drawn-out dissertation of a very dry character on painting—all except the officers, who could not get out. I notice many vacant chairs here, and I presume their previous occupants thought that by vacating the chairs they would get out of the same kind of a proposition. But I assure you that the paper is built on the lines of what we might call the Twentieth Century Limited, and expecting to carry it through on schedule time, I hope no switches will be thrown or bells rung to stop me before I get through.

"PAINTING OF STEEL CAR AND LOCOMOTIVE EQUIPMENT"

BY MILTON L. SIMS, SPECIAL RAILWAY REPRESENTATIVE, SHERWIN-WILLIAMS COMPANY, CLEVELAND, O.

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The subject of painting and maintaining modern steel car passenger equipment is a very live and important one and is of vital interest to all railway officials whose duty it is to look after this important branch of the large railways of this country.

The traveling public demand and expect the very best in the way of comfort and luxury, for which they are willing to pay. They also demand safety, and it is through these demands of the traveling public that the modern steel equipment has come into use at an enormous extra cost over the former equipment of wooden construction.

With the advent of steel coaches, new problems of proper maintenance with protective coatings of paint and varnish come up for serious consideration, as without these protective coatings, iron and steel would soon become weakened by corrosion brought about by the natural elements which produce disintegration of iron and steel.

The well-known methods of painting equipment of wooden construction, would not be suitable for steel, and many attempts to produce methods and materials that would prove satisfactory, have been made by paint and varnish manufacturers and a great deal of research and experimental work has

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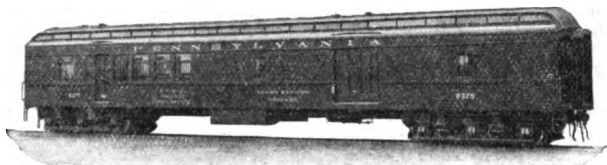
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been done along the lines of producing protective steel coatings which would meet the general demands for economy, durability and speed.

The slogan of the great railways of our country is "Safety First", and the public believe that they are making every effort and sparing no expense to bring about the greatest security to their patrons.

The honest and conscientious paint and varnish manufacturer has a slogan also, which is "Quality First", and they strive to win and deserve your confidence when they come forward and are glad to incur any reasonable expense, in the way of research and experimental work carried on over a period of years by paint and varnish experts with both technical and practical experience of many years in their particular lines.

An intimate acquaintance with hundreds of paint pigments and vehicles, gives them peculiar advantages in selecting the pigments and vehicles which will work in perfect harmony with each other and give the most satisfactory results in every way for the special purpose for which they are designed, and any railway company is perfectly safe in trusting the honesty of the paint manufacturer, whose main purpose and desire is to furnish honest goods that are uniform and reliable, economical to use and at a right price. Honest made goods of quality are worth their price, while cheap material, that is, goods at a low first cost, are often very costly to use in the long run. It is a very simple matter to demonstrate this fact to any railway official who may be skeptical and who looks at first cost only.

This feature of first cost appeals to the Purchasing Department more than it does to the Mechanical Department and we have no serious criticism to make in a general way, as they are anxious to make a good showing of their department to their superiors who look first for operation cost and are not especially interested in a paper-read dealing on the number of coats of paint and varnish, or the number of days, hours or minutes it takes to finish a car or a locomotive.

Details of this nature are left to the Mechanical Department, who are also vitally interested in costs, but, they are interested in the time, the appearance and the durability of the work turned out. If you can show them materials that bring about economy, durability and speed, and will be easy to use and free from devilments, you can get their attention and co-operation. We are living in a rapid fire age and the speed mania has seized upon many to such an extent that oftentimes "Safety" is almost or quite overlooked, and this I am sorry to say is quite often the case in the demand for paints and varnishes. The manufacturers are often too eager for business and rush in with materials and methods that promise results which are often practical impossibilities in the way of time and cost.

A safe, sane and reliable method that shows a first cost slightly greater, may often prove much more economical in constant use and up-keep. But lest I weary some of my hearers, I will try to get down to the crux of the subject before us and deal with it in as short and concise a manner as possible

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and in such a way as I trust may interest, in a measure at least, all of my audience.

Bear with me with patience, if you can, and I would like for you to believe that I am here with you on this occasion with a sincerity of purpose and a desire to try to say something that might be helpful to you.

I am not here to deal in generalities and meaningless words. Whatever knowledge I have of the subject before us, has been learned in the school of "hard knocks", the school of experience, extending over a period of more than forty years of practical painting and paint and varnish manufacture; fifteen of those years as Foreman Painter in railroad service and I deem it a privilege and honor to have been invited to be with you. I am not here to "do you", but to be helpful to you if I can.

PREPARATION.

The preparation of a steel coach for painting is of vital importance and demands the closest attention and should never be left to inexperienced help. It must be done thoroughly, as the absolute removal of all scale, grease and corrosion is necessary before any protective coatings should be applied. Any idea that paint coatings will stop corrosion when it has once started, is not correct. Proper selected paint pigments, combined with the proper vehicles, will prevent the starting of corrosion.

There are several methods for removing rust from steel, such as coating of the surface with oils and rubbing with steel wire brushes, emery cloth, steel scrapers, etc., but the safest and most economical one is the sand blast for the outside of cars. For the interior of a steel car, I would recommend the use of raw linseed oil and benzine or gasoline, in the proportion of one part of the oil to two parts of the benzine, applied with a brush and rubbed down with emery cloth or paper.

The sheet steel used on the interior of cars is much lighter weight and finer texture and does not need the sand blasting to get excellent results. After the rubbing down is completed, the surface should be washed with gasoline and wiped dry with rags or waste and it is then ready for the priming coat, which in all cases should be applied as soon as possible after the surface has been cleaned. This applies especially to the outside surface of the car, where the sand blasting process has been used, as corrosion will start up again in a few hours when the atmosphere is damp or humidity is heavy, and great care should be taken to prevent handling the surface with the naked hands.

We are now ready to apply the priming coat to the steel surface and I would say that this priming coat is the most important one of any that is to follow, except the coats of finishing varnish, and too much care cannot be exercised to see that it is done thoroughly, brushed out evenly and every bolt head and joint coated perfectly, using suitable brushes for the purpose. This priming coat must be made from suitable pigments and carrying vehicles,

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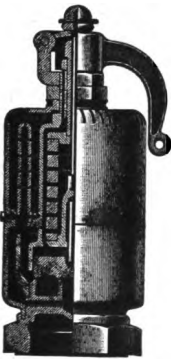
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finely ground and thoroughly incorporated together to work freely and spread smoothly under the brush, dry hard, but elastic enough to safely withstand the contraction and expansion of the steel surface, which varies greatly in different sections of the country. The solid through trains running from the ice and snow of the North, to the tropical climate of the South, has a marked influence in producing cracking and disintegration of paint and varnish films as applied to steel cars much more than wooden cars.

When this priming coat has dried safely, the next step is to hard putty and glaze coat over all rough places and this takes us to the second coat or brush surfacer, which is designed to fit with the priming coat. This material must also be finely ground, work and spread easy over large surfaces. It must dry hard, but elastic, and be made from well-known and selected materials. The next step is to apply a much heavier bodied surfacing material, which is then knifed off, leaving a very smooth surface, which requires very much less rubbing to bring the surface up ready to receive the color coats. The old method of using block pumice stone and water, is dispensed with, and a more modern and safer method of rubbing the surface down smooth by using emery cloth, in connection with equal parts of raw linseed oil and benzine, and then washing or wiping off with rags or waste and clear benzine or gasoline. This method of surfacing does away with all danger from moisture and prevents the starting up of corrosion where any sharp edges or bolt heads may be cut through to the steel. The oil forms a good sealer for the more or less porous surfacing material and forms a safe foundation for the succeeding color and varnish coats.

BODY COLOR.

One coat of specially prepared car body color is now applied. When this is dry, a second coat of specially prepared car body color is applied, which is of an elastic enamel quality, dries hard with a semi-gloss, but makes an elastic surface suitable for striping and lettering. After which two coats of durable outside finishing varnish are applied, and the outside of car is ready for service.

INTERIOR FINISH.

The same priming material shall be used on the interior surface and then followed up with the second coat of brush surfacer. The heavy coat of knifing material can be dispensed with and after the rubbing with emery cloth, oil and benzine has been finished, then follow with a suitable ground work for graining in imitation of natural woods, after which apply two coats of elastic rubbing varnish. Rub to a dead finish with rubbing oil and pulverized pumice stone, or polish if desired. Where solid colors are used on head and side linings, an option is given for the use of special enamels, or quick drying elastic headlining colors to be striped and varnished over.

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I have prepared a steel panel showing the process step by step as described above, so that you can all see just what can be done with the modern method I have attempted to describe.

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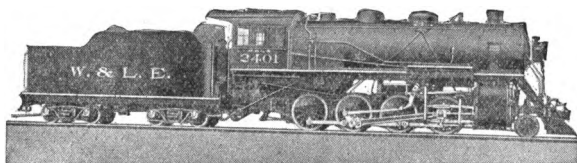
This is not a new and untried experiment—it is the outcome of years of careful observation of results attained by the use of methods formerly and now in use; choosing the good features and eliminating the known unsatisfactory ones and bringing them up to the present day demands, keeping in view always the three essentials of economy, durability and speed.

SCHEDULE FOR PAINTING EXTERIOR OF STEEL PASSENGER COACH.

- 1st Day Apply priming coat.
- 2nd " Hard putty and glaze all rough and uneven parts of surface.
- 3rd " Apply coat of brushing surfacer.
- 4th " Apply coat of knifing surfacer.
- 5th " Rub out with emery cloth, using half and half raw linseed oil and benzine, instead of block pumice stone and water.
- 6th " Apply first coat of car body color.
- 7th " (If Sunday), drying.
- 8th " Apply second coat of car body color enamel.
- 9th " Stripe and letter.
- 10th " Apply first coat durable outside finishing varnish.
- 11th " Drying.
- 12th " Apply second coat of durable outside finishing varnish.
- 13th " Car is completed.

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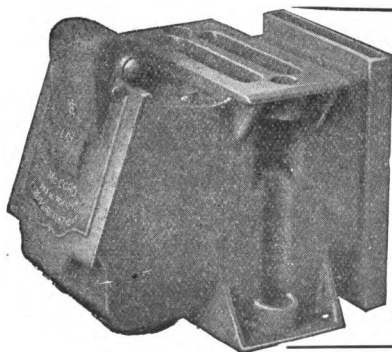
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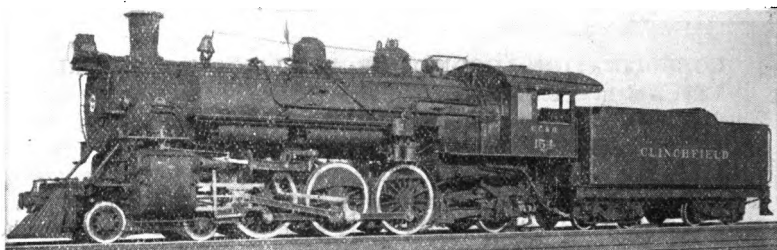
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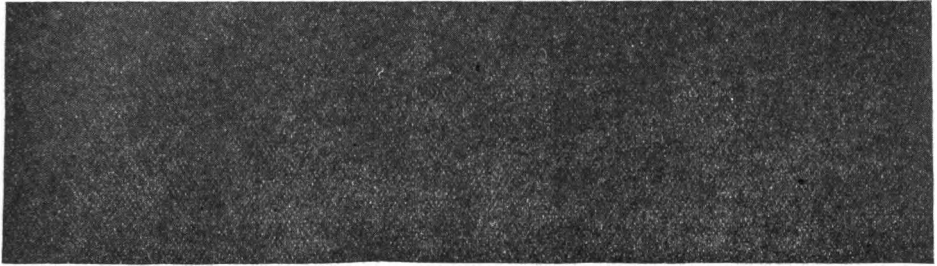
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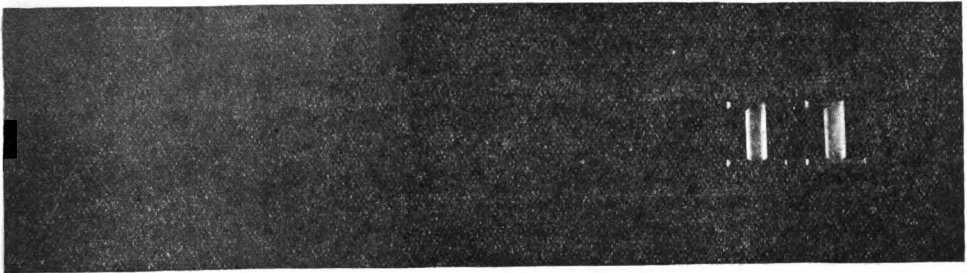
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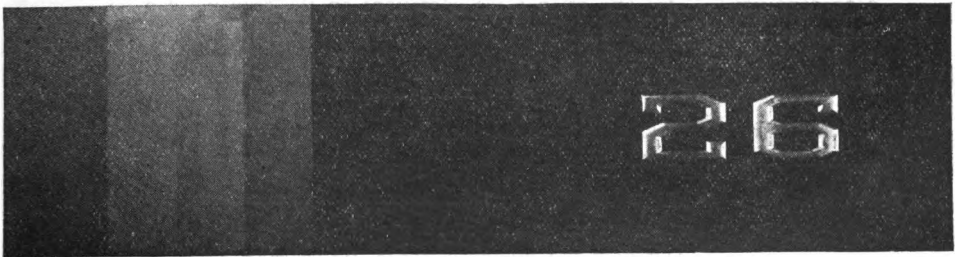
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This gives a very satisfactory job that will wear well. Where shop conditions of heat and ventilation are correct, several days can be cut from this schedule, by applying the first and second coats of car body color in one day and by striping and lettering and applying the first coat of varnish in one day. In fact, any claims made for other methods, can be more than duplicated by the one I have described, but I do not recommend too much speed, unless conditions force the adoption of same.

I am well aware that many claims are made by methods now in use, and that there will be differences of opinions expressed. I cheerfully grant to others the same right to their opinion that I reserve to myself. I believe in the method that I have described above, and that it is safe, sane and reliable when used intelligently.

LOCOMOTIVE PAINTING.

The method used in painting a locomotive, differs very slightly from that of a steel coach. The same primer and surfacing materials are used and rubbed out in the same manner. Then the color coats which are usually black, are applied.

For this purpose an enamel black is used on which the lettering is done and one coat of durable locomotive finishing varnish is usually applied on the water tank or tender, cab, steam dome and sand box, steam chest and cylinder casings, etc., for best work. The enamel black should be made from selected materials which are known for their wearing and heat-resisting qualities. If the surfacing materials are made too rich with oils, blistering on the heated surfaces will often result.

Speed is demanded in locomotive painting, as each day that a locomotive is kept out of service, represents so many dollars of earning power for the railroad company. The machinists, boiler makers, pipe fitters, etc., usually get all the time and the painters get what is left, but it cannot be helped, as time means money here as elsewhere. I have prepared a steel panel showing the different operations of modern method locomotive painting. The actual time necessary to turn out a satisfactory job, depends on shop conditions. Two and often three operations on the schedule can be carried out safely in one day.

SCHEDULE FOR PAINTING A LOCOMOTIVE.

Assuming that the same care has been taken in removing all grease, scale and corrosion from the surface to be painted, proceed as follows:

- 1st Day Apply priming coat of special locomotive primer.
- 2nd " Hard putty and glaze coat all rough and uneven surface.
(This does not apply to trucks, frame work, etc.)
- 3rd " Apply brushing and knifing surfacer to water tank or tender, cab, steam dome, sand box, etc.

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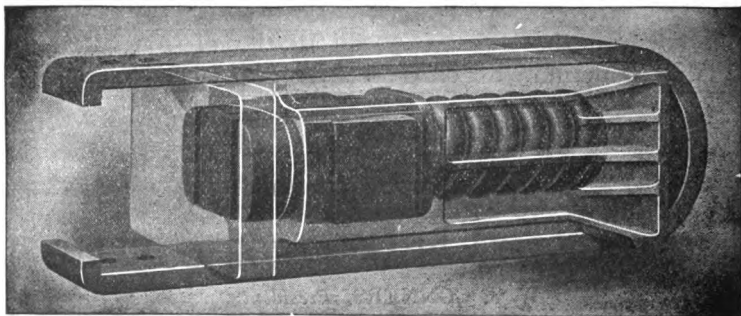
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4th day. Rub out surface with emery cloth, using half and half raw linseed oil and benzine. Wipe off dry with rags or waste and clear benzine, being careful not to use too much benzine. Follow up with coat of black enamel. On best work a coat of flat black is applied over all surface, except trucks, frames, etc., before the black enamel coat is applied.

5th " Letter and finish with a coat of durable locomotive finishing varnish.

Shorter and quicker methods are not reliable or recommended, except for re-painting and repair work.

PAINTING STEEL FREIGHT CARS.

The method of painting steel coal cars has changed very materially in the last few years. Formerly all coatings were made very elastic and very little attention was given to make the first or priming coat, dry any different from the last or finishing. Research work on this matter has proven that the method was wrong and that the first or priming coat should, by all means, be constructed so as to dry hard and elastic, using specially treated vehicles for the purpose and such pigments as will be neutral and last the longest. The finishing coats made more elastic and to have more gloss and moisture-resisting qualities.

The reason for the priming coat being made to dry harder and with less gloss, is that coal cars are subjected to rough usage while being loaded and unloaded. Large lumps of coal striking the sides of the cars glancing blows soon knock off much of the painted surface when the elastic coatings are new.

Special steel car coatings are furnished in all the standard shades, in either semi-paste form or ready for use, with which new cars can be turned out safely in from two to three days. Brown and black are the ones most in use and give the best results when properly manufactured. This class of material should never be purchased on a basis of a low first cost, if durability and protection to the steel surface is desired.

I fear that I have already trespassed on your time and patience and will close with thanks to you one and all for your kind attention.

In conclusion I want to add my word of gratification and pleasure at the entertainment we have received today and to-night. It is always a great pleasure to me to visit large plants of other industries that differ from those with which I am connected. I think everyone here, like myself, must have felt somewhat like an Irishman, whose name of course, naturally was Pat. He was driving a water wagon; he also indulged in the flowing bowl and often fell off of the water wagon. One day he fell off and hurt himself pretty badly, so much so that he had to be carried home. The doctor was sent for and after ministering to him and fixing up his cuts and bruises, said to him: "Pat, if you don't quit drinking you are going to get into serious trouble. It's a sure thing. You must either cut it out or you will get into very serious trouble." "What kind of trouble will I get into?" asked Pat.

"Well," the doctor said, "for one thing it will make you blind." Where-upon Pat exclaimed, "Well, I guess I've seen about everything there is to be seen." (Laughter.) And I feel that way after going through the Hewett Rubber plant, I have seen about everything there is to be seen. Gentlemen, I thank you for your attention.

The PRESIDENT—Gentlemen, the paper is open for discussion. Mr. Sims has certainly presented a very large question. Any one of the three topics that he has mentioned in his paper to-night—the painting of steel passenger equipment or locomotives or freight cars—would be enough to keep us going for an entire evening. I hope we shall have a vigorous discussion on this paper. In order that we may not be too long in getting started I will ask Mr. H. M. Butts, Master Car and Locomotive Painter of the New York Central at West Albany to open the discussion.

Mr. BUTTS—Mr. President and members of the Central Railway Club, I feel like complimenting my friend Mr. Sims upon the paper he has just read to us, especially because he really represents two factions. He originally worked for a living, like some of the rest of us practical men, but he got wise and became a salesman, and I presume, is earning more money and doing less hard work. In writing the paper I think he had the fact in view that possibly some of us practical men might disagree with him, consequently he would not be too radical.

When I read the paper I thought possibly he had lost his courage a little as a representative of a manufacturer, because he does not claim that the process he advocates here in painting steel cars is the only one ever invented that was fit for painting steel cars. You know when these representatives of paint manufacturers get our attention they sometimes endeavor to create the impression that there is only one manufacturer in the world that can make a steel-preservative paint. Well, facts are stubborn things, and sometimes we have to revert to our experiences to convince ourselves that we have been wrong all these years. The fact remains that as far as painting steel cars is concerned, the old adage we often hear that there is absolutely nothing new under the sun can better be applied to painting steel than to any other part of the railroad business today that I know of.

I began my apprenticeship in 1869, and in the shop where I was employed was an Englishman about 60 years old. At that time he used to say to me, "My boy, you'll live many a long day before you'll ever find anything that will beat red lead for priming steel or iron." And I will leave it to the judgment of anybody here if you are very far away from that yet? So it would seem to imply that there is no special reason why we should have any special "steel preservative." I think that any master painter worthy of the name is able to paint a steel car successfully.

Many years ago I had to paint steel tanks and cabs on locomotives. Nothing with which we have to deal, gentlemen, needs as much care to paint and paint right, and make it wear as a locomotive tank. Yet we never thought we were doing anything out of the ordinary to do it. As far as anything

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new in painting steel cars is concerned, 10 years ago there were put into service in New York City 150 steel cars. They were primed and surfaced with one of the leading systems of surfacing; exactly the same primer was used on the steel car that is sold and used on wooden cars; there was no change in the priming or in the surfacing. Those cars have been in service for 10 years, and are giving good satisfaction. From a practical view it would seem to explode the theory that a special primer is required for steel cars, and that it must differ from what you would use for wooden cars. Some of the leading manufacturers of surfacing systems today are using exactly the same method upon both steel and wood.

I might occupy much more of your time, yet I don't know whether I could convince you of the best method of painting steel cars, as everybody has a theory of their own. When you begin to explain all of the why's and wherefore's there is a good deal about it that is hard and difficult to understand. This is because the conditions under which painting is done has very much more to do with the successful completion and the durability of the work than anything else. The best system of priming and surfacing that can possibly be devised for painting either wood or metal, will not produce satisfactory results, unless applied in the proper manner and under proper conditions. The rule is to allow a priming coat 48 hours to dry; experience proves that if the temperature in the shop where the paint is applied is not kept above 75 degrees Fahrenheit, it would not be safe to apply a second coat until double that length of time had expired.

The excessive use of Japan for hastening drying is often employed. This is a very dangerous expedient, for it causes the paint to dry on the surface and remain soft underneath, a condition liable to cause cracking and which is so often noticeable in too hurried work. This also holds good in all subsequent coats above priming.

The system described in Mr. Sim's paper, if intelligently used under proper conditions, will, no doubt, produce a satisfactory result. I do not entirely agree with all of its provisions; one is in puttying on the first coat. I believe it would be better to putty on the second coat. Another is in smoothing down the surface with emery paper and oil. A surfacer composed of a material which can be readily smoothed down with emery paper, in my opinion, is too soft to form as good a foundation for holding up the subsequent coats of paint and varnish as would be obtained if it were composed of harder substances which would require rubbing down with stone and water. Many other points in the paper I would like to take up, but the hour is getting late. I see my good friend Mr. Miller of the Lackawanna and others are patiently waiting to talk on the subject, and I know you will be glad to hear from them.

The PRESIDENT—Mr. Miller, we would be very glad to hear from you. Your name happens to be next on the list.

MR. MILLER—The subject has been so well written up by the author of the paper, and discussed so ably by my friend Mr. Butts, that really little

remains to be said. The matter of protecting steel and iron, in the way of painting locomotives and steel cars, is in fact not a new subject at all. As Mr. Butts said, we have been at it for years. The locomotive has always been receiving our attention, and I think that most of us have been equal to the occasion. The advent of the steel car didn't really bother any of us a great deal, though it seemed to worry some of the paint manufacturers considerably. They got busy without delay, and it must be admitted, have handled the proposition very well.

The entire paper as written by Mr. Sims does not depart very radically from established past practices. It is practically what we have all been doing, with a few variations perhaps, for years past.

I have only one or two little criticisms that I might venture to offer. As stated before, I agree with Mr. Sims in nearly everything he says, especially his remarks regarding the honestly-made materials of good quality being worth their price, and that the cheap goods, at first low cost are very often costly to use in the long run. It has always been a difficult matter for the painter to get hold of just exactly what he wants and requires to properly do his work. There is everybody to satisfy, from the purchasing agent down, and very often he gets something that is not exactly suited for the purpose; but as a rule he manages to get along in a pretty decent sort of way and keep out of trouble.

Mr. Sims says that paint coatings will not stop corrosion when once it has started—which is correct. The surface, however, especially through the use of the sand blast can be again prepared, no matter how badly it has rusted, and it will be as good as ever for the reception of new paint. I disagree with Mr. Sims somewhat regarding the method of producing the surface through the use of oil, benzine and emery cloth, discarding the old-fashioned practice of rubbing with stone and water. There are several objections to it. In the first place, it is expensive; more expensive than the water-rubbing method, and I cannot see that any particular good results from its use. The fact is that any surface rubbed with emery cloth and oil is bound to be inferior to one rubbed with block stone and water. You can get a good enough surface, but it does not produce one as level as will stone and water. That has been my experience, and I think a great many of the boys will bear me out in the fact that it is unnecessary and that the benefit derived from using the oil on the surfacer really does not amount to a great deal. It is also a very dirty practice. It always reminds me of a visit that I paid some time ago to the Berwick shops of the American Car & Foundry Co., where they were building some cars for us, and in the same shop with ours were a lot of Pennsylvania cars. The latter, as you know, are painted red. They were busily engaged rubbing down with emery cloth and oil on those Pennsylvania cars and such a sight you never saw. Those fellows were just covered with this red stuff, their arms up to their elbows, their faces were covered with it, their clothes were covered and saturated with it and the floor was spattered with it. I thought for a time I might be in a slaughter house rather than in a paint shop, or on some battle field over in

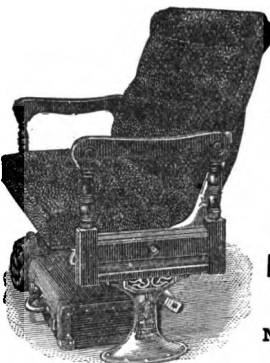
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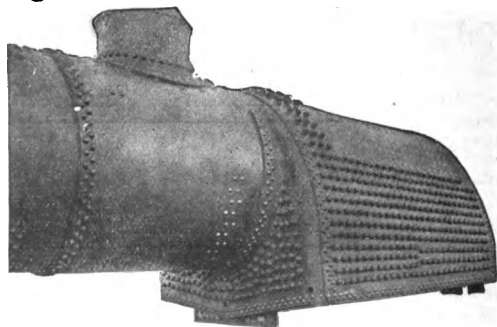
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Belgium. It certainly was a dirty operation. Moreover, I do not believe that it is nearly as economical as the old fashioned way of rubbing.

The paper seems to have been written with a view to bringing out the fact that a car could be completed in 13 days, which is all very good, and is probably no more than a great many of us frequently have to do and have had to do right along. With almost any of the surfacing systems on the market, it is possible to do the work in an acceptable manner in anywhere from 12 to 18 days, and then if you are compelled to do it, through force of circumstances, why, you can still further shorten up the time. The fact remains, however, that as you shorten up the time you impair the durability of the job just that much.

I was rather hoping that Mr. Sims in his paper would bring out the importance of protecting the hidden or inaccessible parts of the steel passenger cars at the time of their building in the passenger car plants, which I consider a very important item. To my way of thinking, the steel passenger car will go to pieces where it is not observable—for instance, along the floor line and underneath the floor, where the water seeps through. Rust will go on there continuously, and before we know it serious damage may be the result. How to protect those parts seems to be quite a problem.

I would emphasize the fact that cars during construction cannot be watched too closely. Above all things, I consider it necessary to have a good practical man there who is thoroughly familiar with paint materials and methods of painting, to look after that portion of the inspection. Some time ago our people thought they would have a look at the hidden parts of some of our steel cars and with that end in view they tore off some of the inside finish—wanted to see how things looked back of it. The cars had been running four or five years, possibly only three or four years. Portions of the wainscoating being removed, we looked the steel surface over, back of the sheets and found that in many places not a particle of paint was left—absolutely none, simply some dust that could be blown away, and when that was brushed off the bare iron was brought to view. The question arose as to what had caused the paint to disintegrate in that manner so rapidly; good material had been used, and for a while we couldn't explain. We then noticed that the dust or the paint pigment, which still adhered to the metal surface, lay in streaks, as would be the case if it has been put on with a brush. Investigation proved that the car manufacturers had used a paste or cement of some kind with which to hold their insulating material in place at the time that the car was being manufactured, and whatever that paste might have contained, it certainly was very prompt in destroying every vestige of the two coats of paint that we had had applied to the steel. Wherever that paste had not touched the surface the paint was as perfect as the day it was put on. We figured at the time that perhaps the paste or cement might have contained something like carbolic acid, to keep it sweet and to preserve it, which had that detrimental effect on the paint. I only mention this in passing to bring out the importance of having the cars thoroughly inspected at the time of construction, by men who are competent in the painting line. I thank you very much, gentlemen, for your attention.

The PRESIDENT—There is present another representative of the D. L. & W., Mr. W. A. Buchanan, foreman painter at East Buffalo.

MR. BUCHANAN—I think, Mr. President, that Mr. Miller has said about all the D. L. & W. has to offer on the subject. There are some things, however, that Mr. Miller has not touched on, in reference to locomotive cabs and locomotive tenders. This happens to be my part of the business. Mr. Sims has given us a very good paper, but we differ with each other in reference to the formulas. Personally, I do not think much of the oil and gasoline process of rubbing. I think it has a tendency to soften the coatings. Then again, there is the factor of fire hazard in connection with it that we do not want around our shops. Mr. Miller has covered the other points that are unsatisfactory. I notice in the schedule for painting a locomotive, that the first day Mr. Sims recommends the priming coat of special locomotive primer, the second day the hard putty and glazing coat. I hardly agree with him that the puttying should be done on that coat. I prefer the next coat to be a coat of good elastic surfacer, then putty and glaze over that coat, because those really are your two wearing coats. I have had the best results from rubbing with water and block pumice stone. I think a better surface is obtained, an even, level surface, and if it is properly done with the guide coatings, there is very little danger of rubbing through, if you watch it closely. All those surfaces should be protected with two coats of varnish. We get very good and lasting results from that sort of practice. Very little care is usually taken with the coating of the under side of a cab roof. We have great trouble with the roof rusting through and invariably the cause is from the under side of the roof, between the ceiling and the under side of the iron of the roof. I think those should receive better care and be thoroughly coated before they are sealed up, because they are surrounded with moisture. As there is no chance for it to dry out the roofs very soon corrode under that part. I think that cheapening the methods of painting is very poor economy. Anything that is done at all is worth doing well in the line of painting, it has always proved the best economy in my experience in painting. I thank you, gentlemen.

The PRESIDENT—We have with us a man who has made quite a trip to get here, and I want to call on Mr. Keil, master painter of the Lake Shore & Michigan Southern, of Elkhart, Ind.

MR. KEIL—I had a dream the other night about coming here. I dreamed I went to heaven and on reaching the gates, found St. Peter sitting there with 15 or 20 men around him; he was looking over the books; and he put these questions to them: "Where are you from?" "New York." "Nobody on the books from New York." "Philadelphia? Buffalo? Cleveland?" "Nobody here." "Now," he says, "I'll put some more questions to you." Of one he asked, "What business did you follow before you died?" The man said, "I was a master car builder." Another said, "I was superintendent of motive power—master mechanic—general foreman." They went

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down the line. I heard him exclaim: "To hell with the whole bunch of you!" I started off. I says, "If you fellows can't get in, I might as well go." He called me back and said, "Hold on there! Where are you going?" I replied, "I don't know. I don't know what to do." Then he asked, "What did you do while you were living on earth?" I said, "I was a painter." "Walk right in," he said, "you had hell enough on earth." (Laughter.)

The supervision of the steel equipment of the various railways is a vital subject. The paper just read by Mr. Sims shows in itself that he has put a great deal of labor into the preparation of his article, both from the standpoints of practical experience and research. In order to keep steel freight cars looking good the first two most important factors that present themselves are a good reliable paint which has been manufactured by a responsible paint firm, and the second is the preparation of the steel.

From my observation, the best method of preparing the steel sheets is by the sand blast process. It may be asked, does it pay to sand blast freight cars? The manufacturers of new cars might object to the sand blast on account of the labor involved, and in its stead would make a strong plea in favor of an acid pickling process of the sheets before being assembled. This process is used with fairly good success on passenger equipment. It is considerably cheaper, and I do not know of any car builders that are using it for freight cars. My past experience is that the sand blast is the most practical and the most economical practice from a standpoint of durability.

Another question that might arise is—does it pay to paint hopper cars inside? Decidedly, no! The coal in-transit wears it all off in a very short period. This conclusion has been arrived at after practical tests have been made. While sand blasting 300 or 400 cars I found that the ends very seldom required the sand blast. The damage to the side sheets is caused by coal freezing to the interior, and the persons unloading the coal resort to the use of a large mallet or sledge to break the coal loose.

In talking with master painters from different sections of the country, I find that they are having considerable trouble with their car roofs rusting out. This condition will soon cause the Master Car Builder a great deal of trouble in keeping up his coach repairs. I attribute the rusting out of steel car roofs to several causes. The roof sheets are applied just as they are received from the steel mills without having the flash scales and rust removed. The inspector's specifications probably only call for two coats of paint. The manufacturer, under this condition, is following the Mechanical Engineer's instructions. It is my opinion that on steel car roofs the sheets ought to be pickled before assembling, or sand blasted, and then a good coat of steel preservative paint applied, allowing 48 hours for drying; then two coats of steel filler to be applied, allowing 24 hours between coats; next two coats of a good grade of hard drying enamel, made especially for steel roofs, allowing 24 hours between coats for drying. A roof treated in this manner will, or ought to, last for 20 years or more without requiring renewals of rusted out sheets.

We are all familiar with the conditions existing at terminals where the car cleaners are required to climb on to the tops of cars in order to fill the

drinking tanks and dining car water supply tanks. The tramping over roofs soon wears the paint off and allows the rust to form.

In locomotive painting the sand blast is the most economical for preparing a new steel cab or steel tender. For a good job of painting it is also the most practical method whereby the old accumulated paint can be removed from old locomotive cabs or tenders. The movable parts, such as domes, cylinder casings, forward trucks, trailer trucks, and all other small parts ought to be put in the large lye vat and be boiled with boiling concentrated potash.

The method of bringing up a locomotive to a good durable and presentable finish, is almost identical with the practice on steel coaches. We are obliged, at times, to eliminate the number of coats the engine ought to receive because the engine is needed for service.

Neglect of keeping steel equipment properly painted will be an enormous loss to the railway companies. Steel coaches have been adopted by all large companies as standard, and having been in service only a few years, they have not reached the stage of any very heavy repairs, but every Master Car Builder is aware that when the time comes for repairs he will have a difficult problem to solve in order to keep the output of his shop up to the demand of accumulated repairs.

The PRESIDENT—That exhausts the list of those who had indicated their intention to discuss the paper, gentlemen. We will now be very glad to hear from any of the members present who have any remarks to offer or criticisms to make.

MR. BUTTS—Mr. President, I would like to hear from Mr. Breese, of the Lake Shore.

The PRESIDENT—Mr. Breese, we should be very glad to hear from you.

MR. BREESE—After listening to Mr. Sims' paper and the able remarks by the gentlemen in discussing it, I do not think there is much more to be said, the subject having been very well covered. It is a very good paper.

But certainly we cannot all agree on some points. I cannot approve of following up priming coat in 24 hours with a second application either of surfacer or putty and glaze coat. There should be at least 48 hours between these two operations. Nor do I agree with the method of surfacing a car or tender the following day, or 24 hours after puttying, especially on a coach, which should have at least 48 hours and longer if possible. As for rubbing with oil, benzine and emery cloth, I agree with Mr. Buchanan that it will soften the under coats. It also is something I would be unable to use in my shops on account of fire risks. Take for example the tank shop. While we are rubbing on one track, the riveters will be working with their furnace on the next track. This you can readily see would make it very dangerous and would not be tolerated by any Insurance Company. As to rubbing coaches, we would practically be in the same position. As the tin smiths are around almost constantly with their fire pots.

THIS SPACE FOR SALE



EASE OF APPLICATION



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THIS SPACE FOR SALE

You cannot produce the same surface with oil and emery cloth that you can with block pumice stone.

(Contributed by Mr. FRANK P. CHEESMAN)—I have read with considerable interest the advance copy of the paper by Mr. Milton L. Sims, but regret that he has not gone into the subject of steel freight car paint more extensively, as my interests, and the interests of my firm, are in that direction rather than in the direction of paints for passenger coaches.

In 1910 it was my privilege to read a paper on the subject of "Protection of Metal Equipment," before the New York Railroad Club, and some of the remarks that I will make now will be to some extent a duplication of what I said then.

While some progress has been made in the method of painting since 1910, the basic facts are about the same as they were then. The subject should be divided into two headings; first, as applied to new cars constructed by car builders not connected directly with the railroad, and second, as applied to the re-painting of steel freight cars by railroads.

Under the first head it is almost impossible, with the conditions as we find them at the car-builders shops, to secure sufficient time for painting the car properly. In many of the shops it is the practice to put on two coats of paint in one day; frequently the stenciling of the car is done that same day or the following day. No shop that I am familiar with has sufficient space to carry on its tracks more than one or two days output when working full time. It is, therefore, absolutely necessary that the cars be moved rapidly. Under such conditions it would be throwing money away to attempt to do a first-class job or to use high grade materials. I would, therefore, suggest that in specifying paint for new steel cars, when not more than twelve to twenty-four hours can be allowed for painting, that only a single coat of paint be specified for the work, and that to consist of an iron oxide paint containing between 30 to 40% sesqui-oxide. The vehicle to consist of pure raw linseed oil, a percentage of Kauri Gum china wood oil mixing varnish with sufficient drier to dry it in the requisite time, making that time as long as possible under the conditions.

The car painted under the above conditions should be shopped in from six to eight months by the railroad and then given a thorough job of painting as described hereafter. If the railroad is not going to re-paint the car within six or eight months, a second coat should then be applied at the car shops, rather than to allow the car to run longer than eight months with only one coat of paint on it. And in that case if a black finishing coat is desired the second coat of paint should contain only sufficient carbon black to make the shade required. The majority of the pigment being iron oxide in combination with magnetic black oxide and inerts.

There is no question but what more paint is ruined by poor application than in any other way. The men who paint freight cars in car-builders shops usually are not skilled painters, and it is necessary under present conditions to apply the paint under various degrees of temperature. It is frequently rained or snowed upon before becoming dry. In many cases the

thinning is done with cheap and worthless oils and japs and the only wonder is that it stands as well as it does under the poor application and thinning.

There is a vast difference in the character of metal almost as much as there is in the character of wood, and this has a great effect on the durability of the paint. If the priming coat could be applied while the metal is warm we could obtain much better results than are now secured.

The designing engineers are apt to overlook the fact that the painting of a steel car is an important factor in the maintenance of it. Frequently a small change in the plans will materially assist the proper cleaning and painting of the car. We often see angles specified where a rounded section could be used just as well, thereby giving the protective coating a better chance, because it is on the edges where it wears off first. On a round bar there is about one-eighth less surface to cover as compared with a square bar of the same sectional area. Quite a little improvement has been made along this line, but much more could be made, especially in the case of pockets which should be avoided in every possible case.

One of the principal sources of corrosion is the rivet heads and the rivet holes. You cannot protect these holes with paint when red hot rivets are used, and I suggested in 1910 that it would pay to even plate these holes with a non-corrosive metal and also use non-corrosive rivets, especially as applied to passenger coaches. At that time there was no method on the market of coating metal which could be utilized for this class of work, but there has been lately introduced a metal spraying apparatus which, I am told, will do this class of work successfully, and a coating of lead, zinc or brass can be applied at a comparatively low cost. A description of this new process of metal coating can be found in *Engineering News*, Vol. 72, No. 18 of October 29th, 1914. I think that the matter would pay the members of this Club to investigate.

All over-lapping joints which cannot be reached to be re-painted should be coated with a heavy coat of pure blue lead made in semi-paste form.

Under the second heading, "The Repainting of Steel Freight Cars by Railroads;" after the surface is put in proper condition by sand blasting off all of the original coating, including the rust and mill scale, I then recommend applying a coat of paint made with a high grade natural ore iron oxide containing about 75% of sesqui-oxide reduced to about 40% of sesqui-oxide with silica and other selected inert pigments non-hygroscopic in their nature. The vehicle to consist of pure raw linseed oil with a selected drier and a percentage of a hard gum china wood oil mixing varnish. Better results could be obtained by the railroad if this paint was bought ready mixed with the exception of the drier, which should be added to the paint at the time of painting. The amount of drier to be governed by the weather and the time allowed for painting.

For a finishing coat I recommend the use of a carbon black paint containing magnetic black oxide in addition to carbon black, and a percentage of selected inert pigments with practically the same vehicles as used in the priming coat.

I would suggest that special attention be given to the quality and size of the paint brush, and that a larger brush than a 6-0 Round Brush or a 6" Flat Brush should not be used, and that the preference be given to the round brush, as the workmen cannot brush the paint in and on as well with a flat brush as with a round brush. I do not believe that a paint spraying machine can be used that will give as durable results as you can secure by using brushes in the hands of good painters.

Of course, I have only gone into this subject in a very broad manner, as a volume could almost be written in regard to the proper application of paint, and the best paints to use for the specified work. It is safe to state, however, that the paint-maker of today is much more scientific in his manufacturing of paint than was the case ten years ago, but notwithstanding this fact, I regret to state that the majority of the railroads today are purchasing poorer paints than they did ten years ago, to the detriment of their rolling stock. I believe that when a railroad finds that a paint-maker is repeatedly guilty of not living up to the paint specifications such people should not be allowed to bid on their paint requirements. Unless the railroads do formulate a plan to eliminate unreliable bidders, it will be hard to induce reputable manufacturers to bid on their paint specification requirements.

The PRESIDENT—Are there any others that want to say something? If there is no one else, gentlemen, we will give Mr. Sims an opportunity to reply to his critics and come back at them.

MR. SIMS—Mr. President and gentlemen, I can say at least one thing, I've started something. I heartily agree with some of the criticisms that have been made. I did not think that my position was impregnable at all. I thought possibly though it might take a 42-centimeter gun to knock some of it out. In the first place, I agree in regard to the actual surface that can be obtained in the use of emery paper and linseed oil and benzine. You, however, lose sight of the fact that the ordinary sand-papering with that method can be very materially improved by the use of a block of wood or a block of rubber in rubbing the letter boards and the large panels of a steel car or a wooden car. In my judgment the necessity for piano finish on a railroad train is past. What you want is durability more than any other one thing. I believe that you, as painters, will agree with me, that no matter how many coats of rough stuff you put on a steel car or a wooden car, you cannot overcome the buckles, or the bolt-heads' drawing in the steel car, or the failure of the carpenters to do a good job of planing and surfacing down of the surface; and the more you put on, and the smoother you get it, as soon as your varnish coats come on they mirror it out and make it look about like a ten-cent looking-glass as compared with a French-plate mirror. It really doesn't add anything to the wearing qualities of the car to go through all of that surfacing.

The method that I recommend is not new, as I say in my paper. By the use of that you get rid of some very serious propositions. In the first

place, going back to the old system of painting years ago, a great many men were all 'round workmen; they could do anything from the mixing of a priming coat, the surfaces of rough stuff, etc., up to and including striping, lettering and finishing. Today that is not true, at least in but very few cases. The piece-work system is largely responsible for it. You have to depend on unskilled workmen, in a great many cases, to rub down your surfaces. When you have the rubbing down with pumice stone and water you have to put on a guide coat, which is not necessary, if you are a good workman, and you all know that that is true. But the unskilled workman has to have a guide coat, and just as soon as he gets that off he feels his job is done. I have been in shops where the piece-work system was carried through, where they had nothing but what we term "hunkies" who couldn't understand a word of our language at all; but they don't work in those shops a great while before they get wise to some things. Talk about the heathen Chinese, etc. some of the workmen employed in railroad shops today on that class of work get wise to how to get that guide coat off without doing very much work. They soon find out what potash water is, and that by taking a piece of pumice stone and soaking it in potash water, when the boss' back is turned, they can get that guide coat off quickly without very much effort; and getting the guide coat off in that way it doesn't necessarily follow that you have a surface. I was in a manufacturing plant not long ago where they were even still wiser and had been caught by the foreman. They had learned how to take a brush and coat over some of the surface with potash water and get it off. Then when that car went to the people who had bought it from the manufacturing concern, in about two or three months perhaps, or even less time, a large part of some of the panels scaled off and the poor varnish and paint manufacturer caught the mischief for the result. Those are the things that you all know are liable to occur. They do occur, and I know it. That does not make perfect the system I speak of, by any means; I know it isn't perfect; and there are very few things that are perfect.

As to the danger of rubbing with oil and benzine, I don't see it, because I have just come from a car manufacturing company where I spent 10 days. In June I stayed there about 13 or 14 days. Everybody is working on the cars at the same time; there are open furnaces and there are trip-hammers or electric hammers and all kinds of work. They do not have any trouble or danger from fire or anything of that kind. If you are using boiled oil I will agree that if you saturate a piece of waste and throw it out in the sun it will ignite; but with raw oil it will not occur. Therefore I do not see the danger of that part of it. As to the dirtiness of it, I have this to say. If you want to preserve your health, if you want to take care of the health of your unskilled workmen who do that class of work—and I am sorry to say that most of it is done by an unskilled class of workmen—why, you can protect their health a good deal better by the use of raw linseed oil and benzine than you can by water, because I assure you that you will never get sick from the use of raw linseed oil; you can drink it, if you want to, and it won't hurt you, if it is pure and comes in a pure form. If given my choice I would rather have it than castor oil, because it will answer the same purpose; and

it is healthy. Furthermore, your hands, instead of getting cracked and bleeding, will be protected, will be as smooth as a baby's. So I do not see anything specially objectionable about that. Now as to economy. I differ from Mr. Miller—and it is an honest difference. If I understand it right, when the Pennsylvania road put this into operation a number of years ago, they cut the price of piece-work 25% and the men made more money than they did when they rubbed with pumice stone and water. I know positively that the difference in cost is quite a few dollars, not cents, in favor of rubbing with oil and benzine in place of water. So I do not agree with Mr. Miller's views.

As to what Mr. Breese says about not puttying the second day, of course that is a matter of preference. In the old days we used a primer that took four days to dry, and we hard-puttied part of it on the second or third day. Today if you talk about four days priming to anybody they will fall dead or kick you out of the place, if you are trying to sell it to them. I am speaking about the possibility of somebody—not me possibly, but somebody, selling ready-for-use primers. As to any painter or any foreman painter in the land, I take off my hat and say, "yes, they are just as competent to make primers and surfacers, etc., as probably any manufacturer, with this exception; it is not for the lack of knowledge, but the lack of facility."

When I went out of the railroad business into the manufacturing business—and I have tried to avoid saying anything that was in the nature of advertising, although advertising pays, the old adage was "early to bed and early to rise makes you healthy, wealthy and wise." Today it is "early to bed and early to rise, work like the devil and advertise"—if you want to succeed. I have a great regard for the master painter in the railroad shops. I keep up my membership in the Master Car Painters Association with which I have had the pleasure of being associated with since 1883. I was painting a good many years before that. The first few years of my life I was in the dairy business—my mother tells me—I was milking, but after that about the next thing I can remember was painting, because I had to start at it, not through poverty, but just necessity, at the tender age of thirteen. If you get out your pencils and figure with me a little you probably will find that I am a pretty old duck in the puddle; not as old as one I figured with once who was telling his experiences; when he got through he said he was 48, and I said "I make you 115." But the differences in men's opinions about painting do not amount to a great deal after all. We all come pretty near agreeing, only that we disagree in some cases. It is like a story I heard of a jury once that was hung, and the deputy sheriff came around to know how many suppers they wanted. The foreman said: "Send us in eleven and a bale of hay—there's one mule in here." I may be the mule; perhaps I am somewhat on the muleish order. I have my ideas but they are not such as do not give way to others, and give them the right and the privilege to differ with me.

In regard to the softening up of the surface. There is no necessity in the world for the rubbing with benzine and raw linseed oil to cause it, if it is done right. Those panels there (referring to some sample panels on the

platform) were prepared just as I have described them. If anybody can find any cleaving off or disintegration or anything of that kind on those steel panels, why, then I will withdraw my statement. No material, either shop mixtures or manufactured articles, is fool-proof. We make them as near fool-proof as we know how to, but they have to be used intelligently, just the same as any other article that is used on a railroad or anywhere else. When I say fool-proof I do not mean disrespect to anybody. That isn't the idea at all. You can soak rough stuff with water, and I have seen it done, especially in large machine shops where they had Austrians to do the work who could not speak a word that I could understand. In one of the largest manufacturers in the United States and probably in the world, where they make the finest machinery for all purposes, for railroad uses and for every other machine shop of every nature, by the time they finished the surface was so thoroughly saturated with water that it scaled off; they had all kinds of trouble in shipping their products to foreign countries, and had to send men to China and Japan to do the work over—machines that cost thousands of dollars—and it was due entirely to the mis-use of water and pumice stone. The material was all right, but they did not use intelligence in its application. I found that their castings, etc., were taken from the foundry and set outside, were entirely coated with red rust. Then they put them in a pickle—and God knows they got into a pickle themselves by the use of the pickle. They neutralized it with lime; that was in accordance with technical ideas, against which I have no fight, because sometimes they are very good and sometimes they are horrible, the same as practical. When I told the superintendent of that immense concern that if he would sand blast his castings it would be the cheapest way; he laughed at me and practically told me he thought I was a fool. He said: "We've been painting over rust for 20 years, we haven't changed our methods in 20 years." I said, "No, but you have been sleeping just the same if you have been doing that way, and you will come out." They have come out since.

There is nothing new under the sun. I didn't expect that I would interest you gentlemen in anything that was really new. I think that Mr. Butts, Mr. Miller and Mr. Kiel, know that my heart is in the right place in regard to the master painters in the railroad shops in this country. I want to give them due credit for everything they do, but when I quit the railroad business because I could not convince the railroad officials they ought to pay me more money than they thought I was worth, and went into another business where I didn't have quite such a hard time to convince the people that I was worth a little more, I thought I knew a whole lot about painting, that it has taken me 24 years—yes, 24 years and 7 months to learn, I am counting the months now very closely, because on the 20th of next March, if I live, I will get the 25-year service gold watch, from the firm with which I have had the honor and pleasure to be connected. That is what they do for their people when they complete 25 years service with them. If you can pull the wool over the eyes of people in the railroad business or any other business, you are a pretty smooth article, because "you can fool all the people part of the time, some of the people all the time, but you can't fool all of them all the time." And we are progressing, to say the least. We

have facilities, of course—hundreds of pigments and vehicles that I never knew anything about, although I thought I was a fairly good painter when I left the railroad paint shop. In our big convention that closed last night with a banquet at the Hotel Statler in Cleveland, the statement was made that we had over 900 liquids, including all kinds of oils, treated and otherwise, varnishes, dryers, japans, etc., and I wouldn't attempt to tell you how many hundreds of dry pigments. By continuous experimental work, trying it on the dog, as the saying is, we being the dog, not the buyers of our materials, we do learn a great deal that we would never live long enough to learn if we lived to be as old as Methuselah in a railroad paint shop. Now that is not saying one thing against the foreman painter in the railroad shop. If I were back in the shop, and anybody told me that I didn't know what I was talking about when I left the railroad, I would have been ready for a fight; but I found out after leaving the shop that a lifetime could never give me the opportunities to learn that I have had since. I am continuing to learn and I am getting good ideas and good advice in travelling all over the country and visiting shops—north, south, east and west and in between—and I get something good wherever I go. I believe I have as many friends in the railroad paint shops throughout the United States and Canada as any other man that is engaged in the manufacture of paints and varnishes. I thank you, gentlemen.

Mr. President, I do not rise to further discuss the subject, but I would like to say to my good friend Mr. Sims, we all agree with him that in starting out in life we were all interested in the milk business. We all hope to complete the circle of life and end it in the second childhood.

Mr. SIMS—Just one word more, Mr. President, and I am through. I believe Mr. Butts, you know me too well to think that I take any exception whatever to anything that has been said by any of the gentlemen here to-night. It wouldn't be an argument at all if everybody agreed on any one thing on this earth; it wouldn't be interesting unless somebody fired a few shots at you. I have a hide like a rhinoceros, and the idea of taking exception to what has been said is the most remote thing in my make-up. I mean that from my heart.

The PRESIDENT—Gentlemen, I am sure we are all very grateful to Mr. Sims for his coming to us and for his very interesting paper which has brought out a very good discussion. Mr. Sims, you have the thanks of the Central Railway Club for your kindness.

On Friday evening, January 8, 1915, we have planned to have an electric railway night. Vice-President Dickson of the International Railway Company has taken in charge the preparation of the data which will be presented, and a number of the heads of departments will be on hand to discuss and describe the various features which are part and portion of that extensive system. I think it will be interesting to all of our members to hear something about the electric railway field, and I am sure we will have a very large attendance that night. Mr. Secretary, have you any announcement of new members to make?

The SECRETARY—Yes, sir. We have enrolled 10 new members. The list is as follows:

Bates, F. D.....General Foreman, L. V. R. R., 233 Gold Street,
Buffalo, N. Y.
Breese, S. E.....Foreman Painter, L. S. & M. S. R. R.,
Cleveland, O.
Blagden, A. S.....Vice-President, Amer. Malleables Co.,
Lancaster, N. Y.
Brockway, Geo. P....Treasurer and Manager, Seneca Oil Works,
Warren, Pa.
Kuhn, William.....S. M. P., T. H. & B. R. R., Hamilton, Ont.
Pierce, Chas. F.....Special Rep., Q. & C. Co., 90 West St., N. Y. City
Sims, M. L.....Spl. Ry. S., Mfg. Expert, Sherwin-Williams Co.,
601 Canal Rd., Cleveland, O.
Thompson, Roy R....Asst. R. of E., N. Y. C. & H. R. R. R.,
87 Burgard Place, Buffalo, N. Y.
Whalen, J. F.....Loco Fireman, Buffalo Creek R. R., 85 Sage Ave.,
Buffalo, N. Y.
Whyte, F. M.....14 Benedict Ave., Tarrytown, N. Y.

There is nothing further on the Secretary's desk, Mr. President.

The PRESIDENT—If there is no further business, a motion to adjourn will be in order.

MR. TOUGHEY—I move we adjourn.

The motion was duly seconded and carried, whereupon the meeting adjourned.

AN APPRECIATION

WHEREAS: The Central Railway Club and its membership have been the beneficiaries to a great extent of the courtesies extended by the Hewitt Rubber Company in throwing open its large and splendidly equipped plant to the inspection of the Central Railway Club members on November 13, 1914, and,

WHEREAS: In addition the Hewitt Rubber Company further extended its great liberality by tendering a sumptuous banquet to the said Club membership at the Hotel Statler in Buffalo on the evening of the aforementioned date, which incident, coupled with the exceptional courtesy extended at the Rubber Company's plant during the inspection of the afternoon, has made a deep and lasting impression upon those who were fortunate enough to attend these functions. Be it resolved by the Central Railway Club:

FIRST. That we regard the courtesy and hospitality of the Hewitt Rubber Company as unusual in the annals of industrialism and entitled to exceptional recognition thereby.

SECOND. That the action of the Hewitt Rubber Company has established a precedent in the matter of submitting their works to inspection and also in the art of entertaining that would be difficult to equal.

THIRD. That it be the sense of the Central Railway Club and its membership that it holds in grateful remembrance the experiences obtained through the Hewitt Rubber Company on the occasions mentioned.

FOURTH. That we extend our appreciation and thanks to the Hewitt Rubber Company for their magnificent effort and accomplishment.

FIFTH. That a copy of these resolutions be transmitted to the Hewitt Rubber Company and that the original be placed in the Proceedings of the Central Railway Club as a memento of the auspicious occasion cited.

W. H. SITTERLY
P. L. ROBERTSON
F. C. PICKARD

SOCIETY OF RAILWAY CLUB SECRETARIES

ABSTRACT OF MINUTES OF ANNUAL MEETING AT ATLANTIC CITY, JUNE 14, 1914

The SOCIETY OF RAILWAY CLUB SECRETARIES held its Eighth Annual Meeting June 14th, 1914, at the Marlborough-Blenheim Hotel, Atlantic City, N. J., Mr. J. B. Anderson, of Pittsburgh, Chairman, presiding.

Other members present were:

Mr. Daniel M. Brady, President,
Brady Brass Co., New York City,
and founder of the Society.

NEW YORK RAILROAD CLUB Mr. Harry D. Vought, N. Y. City

CENTRAL RAILWAY CLUB " " " " "

SOUTHERN & SOUTHWESTERN

CLUB Mr. A. J. Merrill, Atlanta, Ga.

CANADIAN RAILWAY CLUB Mr. Jas. Powell, St. Lambert, Canada

Mr. W. S. Rosevear of the WESTERN RAILWAY CLUB OF CANADA was also present as a visitor, and gave the pleasing notice that his organization desired to be enrolled as a member.

The minutes of the Seventh Annual Meeting having been previously distributed, and there being no omissions or corrections, were ordered approved.

Mr. Vought reported that in accordance with action taken a year ago, a full statement had been made for the information of the Cincinnati Club, of the objects and aims of the Society, and the work it had done. The minutes of the Seventh Annual Meeting had been forwarded to its Secretary, Mr. H. Boutet, who was the guest of the Society in 1913, but nothing further had been heard from that organization on the subject of membership.

It was agreed that the Chairman should pursue the subject further during the year.

It was further reported by Mr. Vought that the work of organizing the Society of National Technical Associations' Secretaries had made progress to the point where everything was in readiness for the first general meeting to complete the same and which would be held some time in October.

Attention was directed to invitations for an informal dinner to be held on the evening of the 13th, for the consideration of questions relating to efficiency in advertising, issued by Mr. L. F. Hamilton, Advertising Manager of the National Tube Co. of Pittsburgh, Pa.

After some discussion it was agreed that as no opportunity for conferring with their respective Executive Committees had been afforded members

of the Society, it would not be advisable to participate in the dinner and that proper explanation of this would be made to Mr. Hamilton by the Chairman of the Society.

The Secretary recommended that the NORTHERN RAILWAY CLUB be dropped from membership, in view of statements as to its status made by its Secretary, and it was so ordered.

The Secretary reported that the total number of copies of the Index of Subjects published by the Society and distributed to members of railroad clubs for 1913, was 7,308, which did not include requests received for copies from other sources from time to time, and it seemed to indicate the usefulness of the publication and appreciation of its purpose.

Reference was made as follows of prospective memberships: CANADIAN NORTHERN OF TORONTO, Mr. Powell; CINCINNATI, Mr. Anderson and Mr. Merrill; CHATTANOOGA, Mr. Merrill.

Approval was given to a statement of receipts and disbursements by the Secretary-Treasurer showing that the Society still has a fair surplus for contingencies, and an appropriation of \$25 was ordered for expenses incurred by him in carrying on the work of the Society during the past year.

Officers for the ensuing year were elected as follows: Chairman, J. B. Anderson, Pittsburgh; Vice-Chairman, A. J. Merrill, Atlanta, Ga.; Secretary Treasurer, Harry D. Vought, New York City.

After an informal discussion of matters connected with the duties of the members of the Society in their respective Clubs and the methods employed in handling work incident thereto, the Society adjourned.

CONSTITUTION AND BY-LAWS

As Revised and Adopted April, 1895.

AMENDED MARCH, 1897.

AMENDED MARCH, 1898.

AMENDED NOVEMBER, 1898.

AMENDED MARCH, 1901.

AMENDED NOVEMBER, 1901.

AMENDED SEPTEMBER, 1902.

AMENDED NOVEMBER, 1905.

AMENDED MAY, 1908.

AMENDED JANUARY, 1912.

CONSTITUTION.

ARTICLE I.

NAME.

The name of this organization shall be THE CENTRAL RAILWAY CLUB.

ARTICLE II.

OBJECTS.

The objects of this Club shall be the advancement and promulgation, by means of reports, papers, investigation and discussions, of knowledge concerning the construction, operation and maintenance of railroads and railroad equipment and the cultivation of sociability among its members.

ARTICLE III.

MEMBERSHIP.

SECTION 1. The membership of this Club shall be composed of persons connected with any branch of railway service, or persons who are engaged in professions or business directly or indirectly connected with the operations of railways.

SEC. 2. Each application for membership must be in writing and made out on standard form, as furnished by the Club, and accompanied by a fee of \$2.00, and indorsed by one member of the Club in good standing, when the Secretary has authority to place the applicant's name on membership roll.

Sec. 3. Membership shall continue until written resignation is received by the Secretary, unless forfeited by non-payment of dues, it being provided that any member may be expelled by a two-thirds vote of the members present at any regular meeting upon the recommendation made by a majority vote of the Executive Committee, that the best interests of the Club may be served thereby.

Sec. 4. Persons may be elected to honorary membership in this Club by the unanimous vote of the members present at any regular meeting, and shall be entitled to all the privileges of membership, but shall be exempt from the payment of the annual dues.

ARTICLE IV.

OFFICERS.

The officers of this Club shall consist of a President, who must be actively engaged in railway service, a First Vice-President, a Second Vice-President, a Third Vice-President, and three Executive Members, who together shall constitute the Executive Committee, and a Secretary-Treasurer.

ARTICLE V.

DUTIES OF OFFICERS.

The President shall preside at all meetings of the Club and perform the duties usually pertaining to a presiding officer; and he shall act as Chairman of the Executive Committee.

The First Vice-President shall in the absence of the President perform all the duties required of that officer.

The Second Vice-President shall in the absence of both the President and the First Vice-President perform all the duties of President.

The Third Vice-President shall in the absence of both the President and the First and Second Vice-Presidents perform all the duties of President.

The Secretary-Treasurer shall keep the minutes of all meetings of both the Club and the Executive Committee, have charge of the publication of the Club Proceedings, have charge of all funds and pay all bills when properly authorized by the Executive Committee and shall submit at each regular meeting of the Club an exact statement of his accounts and the condition of the Club funds, and make such other reports and perform such other routine work pertaining to the business affairs of the Club as may be necessary, under the direction of the Executive Committee.

The Executive Committee shall exercise a general supervision over the interests and affairs of the Club; they shall arrange the program for meetings and entertainments; shall select and appoint a Secretary-Treasurer for the Club, requiring him to furnish suitable bond; authorize all expenditures of the Club, but shall have no power to make the Club liable

for any amount beyond that which at the time of contracting same shall be in the hands of the Treasurer in cash, and not subject to prior liabilities. The Executive Committee shall fix the salary of the Secretary-Treasurer and shall audit his books and accounts. The Executive Committee shall by majority fill any vacancy in office for the unexpired term.

ARTICLE VI.

ELECTION OF OFFICERS.

SEC. 1. A Nominating Committee of three members, not Officers or Executive members of the Club, shall be appointed by the President not later than at the September meeting of the Club. It shall be the duty of this Committee to send to the Secretary on or before November 1st following, the names of consenting nominees for the elective offices to be filled at the annual meeting. Upon the request of any member, the Secretary shall furnish the names of such nominees.

SEC. 2. In addition to the regularly appointed Nominating Committee, any other ten or more members may constitute themselves an independent Nominating Committee and may present to the Secretary on or before December 1st, the names of the candidates whom they nominate, together with their consents to serve.

SEC. 3. At least thirty days before the annual meeting, the Secretary shall mail to each member entitled to vote the names of the candidates proposed by the Nominating Committee or Committees. The names and respective offices to which they are candidates shall be printed on separate lists on the same ballot sheet, each list of candidates to be printed under the names of the Committee proposing them. A member may vote by making a cross with pen or pencil before the name of each candidate for whom he wishes to vote.

Ballots containing more names so marked than there are offices to be filled are defective and will be rejected by the tellers. These ballots shall be mailed by the members to the Secretary in envelopes bearing the indorsement of the voter and in order to be counted they must be in his hands at twelve o'clock noon of the day of the annual meeting.

SEC. 4. The Secretary shall certify to the competency and signatures of all voters and shall deliver the envelopes unopened to the three tellers of election who shall be appointed by the presiding officer at the meeting first preceding the annual meeting. It shall be the duty of these tellers to open the envelopes, canvass the ballots and announce to the presiding officer the result of the vote. An envelope without the indorsement of the voter written in ink upon its back shall be rejected by the tellers as defective and shall not be counted.

SEC. 5. No member in arrears for dues at the time of the election shall have his ballot certified to by the Secretary for acceptance by the tellers.

Sec. 6. The presiding officer shall announce the result of the election and declare the election of the candidates who have received the largest number of votes. In case of a tie vote for any office the presiding officer shall cast the deciding vote.

Sec. 7. The officers elected shall each serve a term of one year or until his successor be elected.

ARTICLE VII.

HANDLING OF FUNDS.

All funds of this Club shall be deposited in a reliable bank, which shall be approved of by the Executive Committee, and all payments on account of the Club shall be made by check signed by the Secretary and Treasurer, such payment being first authorized by the Executive Committee.

ARTICLE VIII.

No patentees, or their agents or agent for the sale of railroad supplies, shall occupy the attention of any Club meeting in the interest of devices in which they are personally or financially interested, unless they are especially invited to do so by a majority vote of the members present, or by consent of a majority of the Executive Committee, and the article they represent forms a part of the subject for discussion at the meeting.

ARTICLE IX.

AMENDMENTS.

The Constitution may be amended at any regular meeting of the Club by a two-thirds vote of the members present, notice of said amendment having been presented in writing at a previous meeting.

BY-LAWS.

ARTICLE I.

MEETINGS.

SECTION 1. The regular meetings of the Club shall be held at Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 P. M., and a majority of the Executive Committee shall have authority to change the date and place of meeting if necessitated for any special purpose that in their judgment is for the best interests of the Club.

SEC. 2. The annual meeting shall be held on the second Friday in January at 2 P. M.

SEC. 3. The President may call special meetings at such time as he may deem expedient, or on the written request of at least five members.

ARTICLE II.

QUORUM.

At any meeting of the Club eleven members shall constitute a quorum for the transaction of business.

ARTICLE III.

DUES.

SECTION 1. The annual dues shall be two dollars, payable in advance on the second Friday in January of each year, of which one dollar shall be in payment of one year's subscription for the printed proceedings of the Club at the published price.

SEC. 2. At the annual meeting of the Club the names of those members whose annual dues are still unpaid for the year then ending shall be dropped from the roll, unless the Executive Committee shall authorize an extension of time to be made including the March meeting, previous notice of at least thirty days having been given such members by the Secretary. The proceedings of the Club shall not be mailed to persons whose names have been dropped from the membership roll, and such members shall not be eligible for future membership until all back dues are paid.

ARTICLE IV.

ORDER OF BUSINESS.

The order of business shall be as follows:

1. Roll call.
2. Reading minutes of previous meeting.
3. Remarks by President.
4. Announcement of new members.
5. Reports of standing committees.
6. Unfinished business.
7. New business.
8. Reports of special committees and reading of papers.
9. Discussion of subjects for debate.
10. Topical discussions of questions submitted to members.
11. Appointment of committees.
12. Election.
13. Announcements.
14. Adjournment.

ARTICLE V.

PUBLICATIONS.

SECTION 1. The proceedings, or such portion thereof as the Executive Committee shall decide, of the regular meetings of the Club, shall be published (standard size, 6 x 9 inches), and mailed to the members of the Club and to the members of other similar Clubs with which exchange is made.

SEC. 2. "The published Proceedings of the last meeting of the year shall contain the Constitution and By-Laws, Index of Papers presented before the Club during the preceding years and the current year, together with a list of the members in good standing at the date of publication.

ARTICLE VI.

AMENDMENTS.

Amendments to these by-laws may be made at any regular meeting of the Club by a two-thirds vote of the members present, notice of such amendment having been presented in writing at a previous meeting.

Central Railway Club

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VOLUME I.

- Meeting of January 1893—"What Practice Should Be Adopted in Order to Collect Bills for a Portion of the Defects Noticed on M. C. B. Cards that Render Certain Cars Unsafe When Card Includes Other Defects Which Are Not Necessary to Be Repaired." By Mr. S. Higgins.
- March 22, 1893—"A Definite Defect Card to Cover Partial Repairs to Cars, Also Covering Such Modifications to Rule 6 as May Be Necessary to Make it Correspond with the New Card." By Mr. John Mackenzie.
- "The Best Practice for Increasing the Efficiency of Locomotives With Regard to Combustion and the Prevention of Smoke." By Mr. A. E. Mitchell.
- April 26, 1893—"Code of Rules Governing the Condition of and Repairs to Freight Cars for the Interchange of Traffic." By Mr. S. Higgins.
- September 27, 1893—"Lubrication of Cars and Prevention of Hot Boxes." By Mr. E. D. Bronner.
- "Modern Practice of Testing and Inspection of Locomotive Boilers." By Mr. George W. West.
- October 25, 1893—"Air Brake Riggings." By Mr. James Howard.
- "Heating of Driving Boxes—Their Causes and Prevention." By M. W. Lavery.

VOLUME II.

- Meeting of January 24, 1894—"Air-Brakes—Their Maintenance and Inspection." By Mr. J. H. Chubb.
- "Leaky Flues—Their Causes and How to Prevent Them." By Mr. J. D. Campbell.
- March 28, 1894—"Typical Interchange and Terminal Yards." By Mr. J. B. Morford.
- April 25, 1894—"Revision of the Interchange Rules." By Mr. H. C. McCarty.
- September 26, 1894—"Locomotive Driving Boxes." By Mr. George W. West.
- "Care of Passenger Equipment." By Mr. F. H. Soule.
- October 24, 1894—"Car Door Hangers, Fastenings." By Mr. J. D. McIlvaine.
- "Pistons, Piston and Valve Stem Packings." By Mr. E. A. Miller.

VOLUME III.

- Meeting of January 23, 1895—"Terminal Yards." By Mr. J. B. Morford.
 March 27, 1895—"Car-Doors and Car-Door Fixtures." By Mr. H. H. Perkins.
 April 24, 1895—"Revision of Rules of Interchange."
 September 13, 1895—"Management of Steam Heat and Passenger Equipment ; Is the Use of a Trap Necessary or Advisable?" By Mr. E. D. Bronner.
 "Comparative Service Derived From Flues in Locomotive Boilers Working With a Steam Pressure of 125 to 140 Pounds When Boiler is Carrying 160 to 200 Pounds." By Mr. E. A. Miller.
 November 8, 1895—"Save-Ending of Boiler Flues." By Mr. J. H. Moore.
 "Stenciled Light Weight of Freight Cars." By Mr. John Mackenzie.
 "Proper Height of Draw Bars."

VOLUME IV.

- Meeting of January 10, 1896—"Injury Caused by the Drummings of Salt Water From Refrigerator Cars, to Track, Bolts, Trucks, etc." By Mr. A. M. Waitt.
 March 14, 1896—"What is the Proper Method of Stenciling the Light Weight on Freight Equipment Cars, With a View of Having the Stenciled Weight Agree With the Actual Weight After the Lumber in the Cars Has Dried Out."
 "Hot Boxes and Their Causes."
 May 8, 1896—"Tool Rooms in Machine Shops and Best Methods of Handling Them." By Mr. S. Higgins.
 "Air-Brake Testing and Inspecting Plants."
 September 11, 1896—"Car Roofs." By Mr. E. A. Miller.
 "Comparative First Cost of Maintenance of Planished Iron Locomotive Boiler Jackets and the Plain Sheet Iron or Steel, Painted." By Mr. J. H. Moore.
 November 13, 1896—"What is the Best Plan to Bring About the Adoption of M. C. B. Standards by Railroads?" By Mr. A. M. Waitt.
 "Shall the Cubic Capacity of Ordinary Box Cars Be Increased, and If So, What Shall Be the Maximum Limit?" By Mr. H. H. Perkins.

VOLUME V.

- Meeting of January 15, 1897—"As Inconvenience is Experienced in Practice Is It Necessary to Apply Repair Cards Indicating Repairs Made Upon Cars When in Transit, in View of the Fact That Such Re-

pairs Are Sometimes Made By Trainmen and Others Who Have Not the Facilities to Make Such Application? What Exception, If Any, Should Be Made to the Rule, Covering This Question?" By Mr. J. R. Petrie.

"Brick Arches in Locomotive Fire Boxes." By Mr. F. B. Griffith."

"Apprentice Boys in Railroad Shops." By Mr. John Mackenzie.
March 12, 1897—"Piece Work in Car Repairs." By Mr. C. McCarty.

"Electricity." By Mr. F. B. Griffith.

September 10, 1897—"Steel Shapes for Trucks; Best Method, Rolled or Pressed." By Mr. H. H. Hewitt.

"Journal Bearing Keys; Their Relation to the Journal Bearing and Box." By Mr. H. F. Ball.

"The Use of Malleable Iron in Car Construction and Repairs." By Mr. Eugene Chamberlin.

November 12, 1897—"How are We to Use the Measurement 4 ft. 6¾ ins. as Noted on Page 10 of the M. C. B. Code That Went In Effect September 1st., When Mounting Second Hand Wheels Where It Is Only Necessary to Remove One Wheel, the Wheel Left on the Axle Having Worn Flange, but Worn Bad Enough to Condemn It?" By Mr. S. Higgins.

VOLUME VI.

Meeting of January 14, 1898—"Springs for Freight Car Wrecks." By Mr. H. C. McCarty.

"Proper Height of Drawbars of Loaded Cars From the Top of the Rail." By Mr. J. R. Petrie.

March 11, 1898—"The Best Method for Keeping Boiler Clean, Including the Value of Blow-off Cocks." By Mr. John R. Magarvey.

"Specifications for Air Brake Hose." By Mr. E. D. Bronner.

May 13, 1898—"Is Any Benefit Derived from the Swaging of Tubes in the Fire-Box End of Locomotives? Is it Advantageous to Anneal the Copper Ferrule Thoroughly Before Applying in Either Case?" By Mr. J. N. Weaver.

"Numbers and Initials of Freight Cars." By Mr. H. H. Perkins.

"Loading of Lumber and Structural Material." By Mr. H. F. Ball.

"Wrong Repairs." By Mr. J. R. Petrie.

September 9, 1898—"Interpretation of the Rules of Interchange as Adopted at the Annual Meeting of the M. C. B. Association at Saratoga." By Mr. H. F. Ball.

November 11, 1898—"Perfection of Top-hinged Oil-box Lids, So As to More Completely Exclude Dust from Journal Boxes, and the Relation of a Tight Fitting Lid to Cost of Lubrication and Number of Hot Boxes." By Mr. C. J. Butler.

"The Most Desirable Material for Driving Boxes, and Should They Be Solid, or Have a Shell Bearing?" By Mr. E. A. Miller.
 "Which Is the More Economical, a Single Nozzle or a Double Nozzle, and What Should Be the Ratio Between Height of Nozzle and Radius of Boilers." By Mr. George W. West.

VOLUME VII.

Meeting of January 13, 1899—"The Most Desirable Material for Driving Boxes, and Should They Be Solid, or Have a Shell Bearing?" By Mr. E. A. Miller.

March 10, 1899—"Freight Car Roofs; What Types Have Shown the Best Results in Service and From an Economical Standpoint?" By Mr. A. M. Waite.

"Round House Practices; the Most Efficient Methods for Cleaning and Preparing Locomotives for Return to Service." By Mr. George W. West.

April 14, 1899—"Rules of Interchange." By Mr. H. F. Ball.

September 8, 1899—"Discussion of Reports Presented at March Meeting.

November 10, 1899—"The Inspection and Maintenance of Air-Brake Equipment at Terminals and on Cars in Transit to Expedite the Movement of Traffic." By Mr. J. R. Petrie.

"Lubrication of Freight and Passenger Equipment." By Mr. G. N. Dow.

VOLUME VIII.

Meeting of January 12, 1900—"Typical Dimensions for Standard Box Cars." By Mr. H. F. Ball.

March 9, 1900—"The Economic Aspects of Technical Education." By Prof. Victor C. Alderson.

"Best Form of Construction, and Methods of Ventilating, Heating and General Equipment of Roundhouses." By Mr. J. W. Marshall.

May 11, 1900—"The Dynamometer Car in Tests for Railroads." By Prof. L. P. Breckinridge.

September 14, 1900—"Efficiency Tests of Locomotives." By Prof. Gustav Lanza.

November 9, 1900—"What Channels of Improvement Afford an Opportunity for Securing Greater Efficiency in the Present Air Brake System." By Mr. Theodore H. Curtis.

"The Interlapping of the Railway Civil Engineer and the Railway Mechanical Engineer." By Prof. H. Wade Hibbard.

VOLUME IX.

- Meeting of January 11, 1901—"What Results Are Being Developed in the Old Class of Freight Car Equipment by the Introduction of the Heavy Type Locomotives and the Large Number of 60,000, 80,000 and 100,000 Pounds Capacity Freight Cars That Are Being Placed in Service." By Mr. Samuel King.
- "Comparison in Facilities and Methods Required in Engine Houses for the Daily Maintenance of the Modern Heavy Type Engines With Their Numerous Special Attachments, With the Practice Ordinarily Followed on the Lighter Type of Engines and the Less Exacting Conditions of Service." By Mr. E. A. Miller.
- March 8, 1901—"Revision of the Rules of Interchange." By Mr. J. R. Petrie.
- April 12, 1901—"Repairs to Pressed Steel Car Bodies and Trucks. By Mr. J. R. Petrie.
- May 10, 1901—"Development in Car Equipment; When Double-Heading With the Heavy Type of Engines What is the Measure of Economy?" By Mr. L. T. Canfield.
- September 13, 1901—"Locomotive Classification." By Mr. Sullivan.
- November 8, 1901—"Locomotive Piston Valves." By Mr. John Player.
- "Best Methods in Shop Practice in Meeting the Requirements for the Maintenance of All-Steel Cars; Probable Future Shop Changes Necessary." By Mr. G. N. Dow.

VOLUME X.

- Meeting of January 10, 1902—"Best Improvement in Boiler Design and Best Proportions of Heating and Grate Surface for Different Kinds of Coal." By Mr. Charles H. Hogan.
- March 14, 1902—"Discussion of Subjects Presented at January Meeting.
- May 9, 1902—"Advantages and Disadvantages of the Standard Box Car." By Mr. H. H. Perkins.
- September 12, 1902—"High Speed Brakes." By Mr. F. M. Nellis.
- November 12, 1902—"The Advantage of Electricity Driven Railroad Shops." By Mr. L. R. Pomeroy.

VOLUME XI.

- Meeting of January 9, 1903—"The Indicator as an Engineer's Instrument. By Dr. Charles E. Lucke.
- March 13, 1903—"Discussion continued on the paper read before the Club in January by Dr. Charles E. Lucke on "The Indicator as an Engineer's Instrument."

- May 8, 1903—Discussion on Dr. Lucke's paper continued.
 September 11, 1903—"The Safety Appliance Law."
 November 13, 1903—"Recent Progress in the Design of Locomotive Front-End." By Prof. F. M. Goss.
 "The Safety Appliance Law." (Continued.)
 "Apprentices in Shops." By Mr. W. O. Thompson.

VOLUME XII.

- Meeting of January 8, 1904—"Gas and Gasoline Engines in Railroad Work." By Prof. William T. Magruder.
 March 11, 1904—"Pneumatic Tools in Railroad Work." By Mr. W. P. Pressinger.
 May 13, 1904—"Why, When Steam Heat Gauge on Engine Shows 75 or 80 Pounds Pressure, in Many Cases Gauges in Cars in Train Will Not Show Anything?" By Mr. Charles H. Hogan.
 September 9, 1904—"What Advancement Has Been Made in Paints for Protection of Metal Parts and Particularly Steel Cars?" By Mr. H. M. Butts.
 "The Use of Soda Ash in Locomotive Tanks." By Mr. S. K. Dickerson.
 November 11, 1904—"Office Organization." By Mr. W. R. Heath.

VOLUME XIII.

- Meeting of January 13, 1905—"A Comparative Study in Locomotive Counterbalancing." By Mr. Irving G. Downs.
 March 10, 1905—"Tire Wear and Tire Turning." By Mr. F. W. Williams.
 May 12, 1905—"Points to be Observed by Enginemen While in Service in Order to Successfully Meet Modern Methods of Freight and Passenger Train Operation." By Mr. W. J. Hurley.
 September 8, 1905—"Hydrostatic Tests of Locomotive Boilers. Is it Necessary or Desirable to Give a Locomotive Boiler Hydrostatic Tests? If so, Should it Be Greater Than the Allowed Steam Pressure?" By Mr. George Wagstaff.
 November 10, 1905—"Railroad Accidents." By Mr. J. B. Morford.

VOLUME XIV.

- Meeting of January 12, 1906—"Work of the Railroad Branch of the Young Men's Christian Association."
 March 9, 1906—"Report of Committee on Variation in Height of Couplers." By Mr. James Macbeth, Chairman.
 "Mechanical Stokers." By Mr. John W. Cool.
 May 11, 1906—"Friction Draft-Gear." By Mr. W. O. Thompson.
 September 11, 1906—"Safe Loading of Commodities in Gondola Cars." By Mr. O. C. Porcher.
 November 9, 1906—"Locomotive Superheaters." By Mr. F. J. Cole.

VOLUME XV.

- Meeting of January 11, 1907—"Tonnage Rating of Engines." By Mr. D. C. Buell.
- March 8, 1907—"Vanadium Steel in Railroad Practice." By Mr. J. Kent Smith.
- May 10, 1907—"The Proper Installation and Use of Compressed Air in Railway Shops and Manufacturing Establishments." By Mr. W. P. Pressinger.
- September 13, 1907—"The K Triple in Modern Brake Service." By Mr. John P. Kelly.
- November 8, 1907—"Steel Rails." By Mr. Franklyn E. Abbott.

VOLUME XVI.

- Meeting of January 10, 1908—"Some Joint Problems of the Mechanical and Operating Departments of a Railroad." By Mr. Dexter C. Buell.
- March 13, 1908—"Some Instructive and Methodical Ideas as to the Handling of High Pressure Power by Enginemen so as to Render Satisfactory Service to Both the Mechanical and Transportation Departments." By Mr. John A. Talty.
- May 8, 1908—"Possibilities of High Speed Tool Steel; A Revision of Recorded Tests, H. P. Requirements, etc." By Mr. L. R. Pomeroy.
- September 11, 1908—"Electric Traction vs. Steam Railroad Operation." By Mr. W. H. Evans, M. M., International Railway Company of Buffalo.
- November 13, 1908—"The Relation of the Brick Arch to the Efficiency of the Present Day Locomotive Boiler." By Mr. George Wagstaff.

VOLUME XVII.

- Meeting of January 8, 1909—"A Modern Method of Cutting Steel." By Mr. Cecil Lightfoot.
- March 12, 1909—"The Use of Steel in Passenger Car Construction." By Mr. John McE. Ames, M. E., American Car and Foundry Company of New York.
- May 14, 1909—"Practical Instruction on Bituminous Fuel Economy." By Mr. Frank Tuma.
- September 10, 1909—"Transportation of Dangerous Articles. Railway Officials' Responsibilities and Duties." By Col. B. W. Dunn, Chief Inspector, American Railway Association.
- November 12, 1909—"Electrical Transference and Transshipment of Freight at Railway and Water Terminals." By Mr. H. McL. Harding.

VOLUME XVIII.

- Meeting of January 13, 1910—"Car Interchange. Past, Present and Future." By Mr. W. O. Thompson, M. C. B., N. Y. C. & H. R. R. R., Twentieth Annual Dinner and Entertainment.
- March 11, 1910—"Electric Car Lighting." By Mr. J. R. Sloan, General Electrician, Pennsylvania Railroad, Altoona, Pa.
- May 13, 1910—"Present Status and Tendencies of Railroad Electrification in America." By Mr. F. Darlington, Westinghouse Electric & Manufacturing Company.
- September 9, 1910—"Analysis—Chemical and Otherwise." By Mr. E. M. Tewkesbury, General Superintendent, South Buffalo Railway.
- November 11, 1910—"The Educational Bureau of the Union Pacific Railroad." By Mr. Dexter C. Buell, Chief, Educational Bureau of Information, U. P. R. R.

VOLUME XIX.

- Meeting of January 12, 1911—"Lubrication of High Pressure, Slide and Piston Valve Locomotives—Both Non and Superheated Types." By Mr. W. O. Taylor, Mechanical Expert, Plainfield, N. J.
- March 10, 1911—"Influence of Gravity on Trains Descending Grades, and Brake Power Necessary for Safe Control." By Mr. John P. Kelly, President, The Air Brake Magazine, Meadville, Pa.
- May 12, 1911—"Train Dispatching by Telephone." By Mr. G. K. Heyer, Railway Sales Engineer, Western Electric Company of New York City.
- September 8, 1911—"Conservation of Waste." By J. P. Murphy.
- November 10, 1911—"The Distribution of Instructions and Information in Large Industries." By F. M. Whyte.

VOLUME XX.

- Meeting of January 11, 1912—"The Effects of Cold Weather Upon Tonnage Rating." By Professor Edward C. Schmidt.
- March 8, 1912—"Safety Appliances and Injury to Employees." By Mr. W. O. Thompson.
- May 10, 1912—"Wireless Train Control." By Mr. Frank Wyatt Prentice.
- September 12, 1912—"A Practical Application of the Routing System to Locomotive Repairs." By Mr. Henry Gardner.
- November 8, 1912—"Wheel Sliding Under Heavy Passenger Equipment." By Mr. John P. Kelly.

VOLUME XXI.

- Meeting of January 9, 1913—"Freight Car Tactics." By Mr. Arthur Hale, General Agent American Railway Association.
- March 14, 1913.—Report of Standing Committee on Master Car Builders Rules of Interchange. Paper by W. H. Sitterly, G. I., Pennsylvania R. R., Proper Preparation of Repair and Defect Cards; Transfer and Adjustment of Loads.
- May 9, 1913.—"Signal Department on Railroads." By Mr. B. H. Mann, Signal Engineer Missouri Pacific R. R.
- September 12, 1913.—"Freight Car Troubles." By Mr. J. C. Fritts, Master Car Builder, D., L. & W. R. R.
- November 14, 1913.—Illustrated lecture, "Mine to Molder," by Mr. Henry B. B. Yergason of Rogers, Brown & Co., Cincinnati.

VOLUME XXII.

- Meeting of January 9, 1914—"Air Brakes: Why Their Possible Utility and Performance is not Obtained in a Higher Degree in Actual Service." By Mr. Walter V. Turner, Chief Engineer, Westinghouse Air Brake Company.
- March 13, 1914—Report of Standing Committee on Master Car Builders Rules of Interchange.
- May 8, 1914—"Treating Railroad Ties and Timbers as Practiced in America." By W. F. Goltra, President W. F. Goltra Tie Co., of Cleveland, O. "Forestry and Forest Fire Fighting." By William G. Howard, Assistant Superintendent State Forests, Albany, N. Y.
- September 11, 1914—"Locomotive Arch Brick." By George Wagstaff of the American Arch Company.
- November 13, 1914—"Painting of Steel Car and Locomotive Equipment." By Milton L. Sims, Manufacturing Expert, Sherwin-Williams Company, Cleveland, O.

Central Railway Club

LIST OF MEMBERS

Honorary Members

Fuhrmann, Hon. L. P. Mayor, Buffalo, N. Y.
Gould, Amos 357 N. Division St., Buffalo, N. Y.
Howe, H. B. Eveleigh, Sydney, N. S. W., Australia
Kirby, John Adrian, Mich.
McWood, Wm. Supt. Car Dept., G. T. R. R., Montreal, Que., Can.
McKenzie, John Cleveland, Ohio
Waitt, A. M. 165 Broadway, New York City

Active Members

BUFFALO, N. Y.

Aitken, Allen J. Gen. Supt., Iroquois Iron Works, 55 Berkley Place,
Buffalo, N. Y.
Andrews, W. G. Pratt & Lambert, Buffalo, N. Y.
Andrews, W. H. G. M., Pratt & Lambert, 78 Tonawanda St.,
Buffalo, N. Y.
Ashmead, Frank M. . . Civil Engr., Penna. R. R., 135 Richmond Ave.,
Buffalo, N. Y.
Aske, S. J. R. F. of Engr., L. S. & M. S. R. R.,
705 Northampton St., Buffalo, N. Y.
Avery, W. E. Foreman, Pullman Car Co., 631 E. Utica St.,
Buffalo, N. Y.
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- Whalen, J. F. Loco. Fireman, B. C. R. R., 85 Sage Ave.,
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- Wheeler, C. W. Air Brake Insp., N. Y. C. & H. R. R. R.,
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- Whitehead, G. W. Metallurgist, Lackawanna Steel Co.,
411 Norwood Ave., Buffalo, N. Y.
- Whitehead, VanL. Jr. Mgr., Whitehead Bros. Co., 2 Mechanic St.,
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- Whitney, W. M. C. C. to Principal Asst. Engineer, P. R. R.,
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 . Buffalo, N. Y.
 Williamson, D. H. Loco. Engr., D. L. & W. R. R., 370 Potomac Ave.,
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 Wurtz, Julius Trans. Agt., G. T. R. R., River St., Buffalo, N. Y.
 Yates, Blinn Secy-Treas., Buffalo Air Brake Co.,
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 165 Broadway, New York City
 Anthony, J. T. Mgr., Sales Dept., American Arch Co.,
 New York City
 Arter, W. D. Supt. Apprentices, N. Y. C. & H. R. R. R.,
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 New York City
 Bourne, Geo. L. V. P., Locomotive Superheater Co.,
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 Brady, Daniel M. Pres., Brady Brass Co., 95 Liberty St.,
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 Brady, James B. 170 Broadway, New York City
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 Brown, Harold A. E. Rep., Pocket List, 75 Church St., New York City
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 Lines, Grand Central Terminal, New York City
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 165 Broadway, New York City
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 New York City

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Gould, W. S.....Gould Coupler Co., 30 E. 42d St., New York City

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- Post, George A.....Pres., Standard Coupler Co., 30 Church St.,
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- Price, Thomas.....Salesman, Midvale Steel Co., 50 Church St.,
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- Randolph, John L.....Eastern Sales Mgr., Economy Devices Corp.,
30 Church St., New York City

- Rea, Samuel G. V. P., Pressed Steel Mfg. Co., 90 West St.,
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- Ronan, E. J. Rep., Gold Car Heating & Lighting Co.,
17 Battery Place, New York City
- Rosenfelt, Samuel D. . . Franklin Ry. Supply Co., 30 Church St.,
New York City
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- Salisbury, W. E. Insp., Loco. Brick Arches, American Arch Co.,
30 Church St., New York City
- Savage, H. D. Vice Pres., American Arch Co., 30 Church St.,
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- Sawyer, E. T. Rep., Commercial Acetylene Ry. Light & Signal Co.,
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- Schlaflge, William Gen. Mech. Supt., Erie R. R., 50 Church St.,
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- Shults, Chas. Coatsville Rolling Mill Co., Room 1773,
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- Shults, F. K. V. P., The Bettendorf Co., Room 2054,
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- Wagstaff, George American Arch Co., Room 2034,
30 Church St., New York City
- Walker, E. H. Vice Pres., Standard Coupler Co.,
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- Ward, John E. Standard Heat & Ventilation Co.,
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MISCELLANEOUS

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Barnaby, Robert.....Foreman, Car Inspectors, D. L. & W. R. R.,
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Baxter, Robt. W.....Gen. Supt., I. C. R. R., Chicago, Ill.
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Billington, M.....Foreman Boiler Maker, B. R. & P. R. R.,
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Brady, W. H.....Gen. Foreman, B. R. & P. R. R., Salamanca, N. Y.
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- Callahan, J. F., Jr. . . . Foreman, Small Work Dept., Amer. Loco. Co.,
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- Cameron, Fred. C. Corning Glass Works, Corning, N. Y.
- Carney, Chas. J. Shop Engr., American Loco. Co., Dunkirk, N. Y.
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- Carson, D. J. Mgr., American Malleables Co., Lancaster, N. Y.
- Chapin, C. T. Special Rep., National Car Wheel Co.,
Rochester, N. Y.
- Chapin, E. H. V. P., National Car Wheel Co., Box 1000,
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- Clancy, J. R. 249 N. Salina St., Syracuse, N. Y.
- Coffin, W. E. National Malleable Castings Co., Cleveland, O.
- Collins, M. W. Gen. Mgr., Maloney Oil Mfg. Co.,
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- Colson, A. C. Gen. Foreman, D. A. V. & P. R. R., Dunkirk, N. Y.
- Colwell, F. G. G. F., N. Y. C. & St. L. R. R., Stony Island Sta.,
So. Chicago, Ill.
- Conley, A. H. F. B. M., Penna. R. R., 208 N. 4th St., Olean, N. Y.
- Cooper, George A. Frost Railway Supply Co., Detroit, Mich.
- Cooper, J. H. Mech. Expert, Dearborn Drug & Chemical Co.,
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- Cope, E. E. R. F. of E., B. R. & P. R. R., 101 S. Franklin St.,
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- Crone, A. E. Supply Agent, Buffalo Brake Beam Co.,
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- Cunningham, R. C. . . . Mech. Expert, Westinghouse Air Brake Co.,
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- Daly, D. R. Gen. Mgr., J. H. Gautier & Co., Green & Essex Sts.,
Jersey City, N. J.
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- Davis, Chas. H. M. E., South Yarmouth, Mass.
- Davis, Walter A. Gen. Foreman, B. R. & P. R. R., 519 W. Wehr Ave.,
DuBois, Pa.
- DeArmond, W. C. Pres., The Protectus Co., Philadelphia, Pa.
- Demarest, H. N. G. C. I., Penna. R. R., Williamsport, Pa.
- DeSalis, Joseph Chief R. F. of E., N. Y. C. & H. R. R. R.,
East Syracuse, N. Y.
- Devans, E. J. Gen. Supt., B. R. & P. R. R., Rochester, N. Y.

- Dodd, L. C.....Mgr., Magnus Metal Co., Depew, N. Y.
- Dolph, J. R.....Roundhouse Foreman, L. S. & M. S. R. R.,
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- Doolittle, B. F.....Trainmaster, D. L. & W. R. R., 1019 Lake St.,
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- Dubert, Harry.....Chief Draughtsman, Amer. Loco. Co., 91 King St.,
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- Dunham, T. P.....R. R. Rep., Garlock Packing Co.,
Northumberland, Pa.
- Duntley, W. O.....Chicago Pneumatic Tool Co., Chicago, Ill.
- Eagan, James T.....Loco. Engr., B. R. & P. R. R., 202 W. Scribner Ave.,
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- Eden, B. H.....Supt., Steel Plant, Gould Coupler Co., Depew, N. Y.
- Edwards, O. M.....President, The O. M. Edwards Co., Inc.,
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- Elder, Jno. R.....Conductor, B. R. & P. R. R., Lock Box 63,
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- Elliot, A. H.....Rep., Amer. Brake Shoe & Fdry. Co.,
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- Everett, Ira.....Asst. Shop Supt., L. V. R. R., Sayre, Pa.
- Finger, E. P.....Gen. Car Foreman, B. R. & P. R. R., DuBois, Pa.
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- Fleharty, J. H.....Salesman, Jos. T. Ryerson & Son,
Western Reserve Bldg., Cleveland, O.
- Flory, Burton P.....S. M. P., N. Y. O. & W. R. R., Middletown, N. Y.
- Flynn, Walter H.....S. M. P., M. C. R. R., Detroit, Mich.
- Ford, F. L.....Foreman, P. R. R., 320 Delaware Ave., Corry, Pa.
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- Fries, A. J.....A. S. M. P., New York Central Lines, Depew, N. Y.
- Fritts, J. C.....M. C. B., D. L. & W. R. R., 234 Wheelers Ave.,
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- Gardner, Fred.....Railway Supplies, 339 Railway Exchange Bldg.,
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- Gardner, Henry.....Asst. Supt. Shops, B. & O. R. R., Mt. Claire,
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- Garvin, H. L. Supt., National Car Wheel Co., Sayre, Pa.
- Goodnow, T. H. Gen. Supt. Shops, Armour Car Lines,
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- Goodnow, W. T. Pres., Sayre Stamping Co., Sayre, Pa.
- Goodwin, James T. Tube Expert, National Tube Co., 40 Grove St.,
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- Gould, J. O. Works Mgr., Gould Coupler Co., Depew, N. Y.
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- Hamilton, William Pres., Erie Car Works, Erie, Pa.
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- Harris, A. J. B. M. E., Merchants Despatch Transportation Co.,
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- Hawkins, B. H. Supt., McCord Mfg. Co., Detroit, Mich.
- Hayden, Geo. W. Gen. Supt., Gould Coupler Co., Depew, N. Y.
- Heller, G. A. Trainmaster, N. Y. N. H. & H. R. R.,
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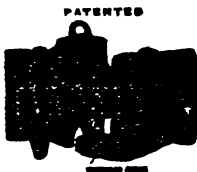
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